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NO. 18.

Memoir upon the Vineyards and Wines of Champagne in France: Written in answer to certain Queries circulated by M. CHAPTAL. *By M.* GERMON, *of Epernay.*

(Continued from page 12.)

XXIII. *What is the Method of operating in the Press, in order to make White Wine?*

THE press being previously well washed and cleaned, and the screw inspected and greased, the fruit is pressed by three successive and rapid turns of the screw in certain districts, and by two only in others, according to the experience of the proprietor, the strength of his machinery, and the expertness of his workmen, or the nature of his grapes. The whole of this operation should be finished in less than an hour by good workmen. Before applying the press, three or four layers of billets or pieces of wood are thrown upon the grapes, placed in such a way as to make the pressure general. After allowing the juice to flow for about five minutes, the press is slack-

ened, in order to stir up the remaining mass, and clear away any obstructions, and the operation is repeated.

The wine flows through a hole into a small tub, called a *carbou*, placed under the press.

When the three pressures have been effected, the wine produced from the juice is called *vin d'elite*, or choice wine. It is called in the language of the workmen *vin de cuevée*, or wine of the tub; but of this expression I highly disapprove, as it gives an idea to strangers that the white wine of Champagne is allowed to ferment (*cuver*) in tubs.

This *vin d'elite* is carried from the *carbou* into a tub adjoining, in which it is allowed to deposit its lees and all other heterogeneous matters during the night: this tub is called the *cuve de depot*.

After this *vin d'elite* is extracted, there still remains some juice in the husks of the grapes: a new turn therefore is given to the screw of the press, and the wine issues through a hole placed a little lower in the press into another tub: this juice is called the *first cut*, (*premiere taille*,) and frequently enters into the composition of the *vin d'elite*. If the wine is not already too vinous, the juice from this last pressure is allowed to flow for about an hour, according to the season or other circumstances.

Another pressure is still given at a subsequent period, and the wine is called *deuxieme taille*, or *vin de tisanne*, so much called for at certain seasons.

A third pressure is sometimes given at another interval, and the wine is muddy, hard, and vinous.

Lastly, a poorer kind of wine, called *vin de rebechage*, is produced by repeatedly pressing the husks until they are perfectly dry: these operations are also called drying the huks.

The *vin d'elite*, after having been allowed to remain all night in the tub, where it deposits its sediment, &c. is

put into new or well rinsed puncheons, and the juice from the subsequent pressures is successively treated in the same way.

XXIV. *What Use is made of the Wines last drawn off, which are generally very spirituous; but which, being coloured, cannot be mixed with the first Juices?*

As it has been experienced that the Champagne wines of the last pressures, notwithstanding their vinosity, are too weak, and would occasion too much waste of time and expense to distil them into brandy, it is found more advantageous to sell them in the vineyards of inferior quality, in order to improve the poorer kinds of wine: they are sometimes sold also to innkeepers, after a sufficient quantity has been retained for the use of the domestics of the proprietor.

In some places, however, these wines are distilled; but it requires from five to eight pieces of them to make one piece of brandy.

[Articles 25, 26, 27, and 28, regard the making of red wine, and will be treated of under a separate head.]

XXIX. *How is Red Wine made?*

The grapes for making red wine are managed with the same precautions as those for white wine.

The only difference consists in loosely depositing the grapes for making red wine in vessels for the purpose: these vessels are covered, and their contents are allowed to remain until the first fermentation has begun in the colouring pellicle of the fruit.

This must, in a state of fermentation, is deposited under the press: the same turns of the screw are given as to the white grapes.

XXX. ***How are the White Wines managed until they are fit for drinking?***

The white wine, when left in the state described at the end of No. XXII. enters into fermentation, at first rapidly, and afterwards in a milder manner: when it has gone through all these degrees of fermentation it becomes clear; and when the weather is dry with a clear frost it is racked off, being previously fined with a proper quantity of isinglass. With one pound of Marseilles isinglass forty pieces of wine are fined.

XXXI. ***What is the Process of clarifying White Wines; and at what Age are they bottled?***

The isinglass is prepared by breaking it, in order to divide it into small pieces: it is then diluted in some wine drawn from the puncheon. When both are well mixed up together, it is introduced into the bung-hole of the cask, its contents being briskly agitated with a staff or other instrument: the wine is then allowed to rest: it undergoes another slight fermentation, until the coldness of the weather finally settles it.

One month or six weeks afterwards it is again racked off; and a slight proportion of isinglass is added, to bring it to a state of perfect limpidity.

XXXII. ***At what period is it bottled?***

In the month of March these wines are generally bottled.

XXXIII. ***How is the Operation of Bottling performed?***

The wine is drawn off into bottles well chosen, well rinsed, and of an approved manufacture: they are corked with the very best kind of corks: pieces of thread or iron wire are used for fixing down the corks firmly; the bot-

tles are then put into the cellar, and piled up on their sides.

The elaboration of the juice not being completed when the wine is bottled, a slight fermentation takes place in the bottles. About the middle of August in the same year this fermentation begins, and frequently there is a loss by the end of September of five or ten per cent, from the bottles breaking. This loss sometimes goes on increasing until next year, according as the wines are more or less juicy or vinous.

XXXIV. *Is it necessary to cover the Corks with Wax.*

It is not necessary to wax the corks when the wine is bottled: this expense would be thrown away; since about fifteen or eighteen months after being bottled, when the wine has exhausted all its fermenting principles, and is to be sold and sent off, it must be again disturbed, in order to undergo the operations pointed out in No. 38. This moving of the wine consists of making a slight deposit disappear, which, notwithstanding the first clarification, is indispensable in the different operations necessary: Secondly, such bottles must be filled up as have leaked or lost by filtration through the corks, and the broken bottles are also to be removed.

XXXV. *What are the Faults to which White Wines are subject, either in Casks or Bottles?*

The faults to which white wines are most liable are muddiness, (*la graisse,*) acidity, and sometimes also yellowness of colour. White wine very rarely becomes muddy when in the casks; but this happens sometimes with bottled wines.

The wine is said to be greasy (*gras*) when it is milky and whitish, and when it does not sparkle and present bubbles on its surface when hastily poured out.

When it is ascertained that this accident has happened, care must be taken not to disturb the wine, and the disease generally cures itself by the next or following spring. The whitish sediment turns brown, and deposits or attaches itself to the bottle; and the wine becomes once more diaphanous and sparkling.

XXXVI. *What are the Means used to remedy this?*

When the season has been rainy, the vintage wet, and the juice is too watery, this disease is very frequent; and besides, if the white is in more abundance than the red fruit, the yellow disease is mixed with what is called the greasy, and in this case it is no longer fit for sale: it has a disagreeable taste, and is of the colour of cider: nothing can be done with it, unless it is mixed with common or inferior red wines.

Greasy wines must be cured by time alone; and they very rarely continue more than a year in this state.

All the preservatives recommended in books upon this subject are of no avail: when employed, they are found to injure the quality of the wine instead of improving it.

Note. Acidity being more peculiar to red wines, it will be treated of under that head.

XXXVII. *How does it happen that Half of the Bottles are broken during the first Six Months?*

The breaking of the bottles is owing to several causes more or less direct and more or less well ascertained.

It depends in the first place upon the choice and quality of the wine; the time at which it is put into bottles; the quality of the glass; the nature of the cellar; the temperature of the weather, and even on the way in which the bottles are packed. We cannot therefore assign the exact cause of this accident, so much connected with the phe-

nomena of nature: in general, however, when a proprietor has no more than twenty bottles broken in one hundred he does not complain.

XXXVIII. *When White Wines deposit a Sediment in Bottles, what are the Methods of extracting this Sediment before sending them off to their Place of Destination?*

The sediment in white wines, when they are not spoiled in other respects, is made to disappear in the following way:

If the wine is not muddy the operation is very simple: it consists in emptying the bottle with care, keeping it in the precise direction in which it lay: the workman with a small hook removes the iron wire which fixes the cork; he then uncorks the bottle, and presents in a perpendicular direction another bottle to it quite empty and well rinsed, and pours out all the wine, leaving the sediment, which, if the bottle has not been shaken, will remain at the bottom.

Some persons make use of a siphon, when the wine is not thick, in order to avoid all shaking.

When the wine is thick the operation is more tedious and more delicate: wooden planks are made use of, in which holes are made at proper distances, in order to receive the bottles: these planks being arranged, adjoining to the collection of bottles, an intelligent and experienced workman carefully takes a bottle from the heap, keeping it in the same position in which it lay: he then gives it a slight shake, and by a regular and long continued movement he brings into the side of the bottle the sediment which is detached, and, without scattering it through the liquor, makes it slowly descend to the neck: he then places his bottle upon the plank which lies ready to his hand, inclining it in a sloping direction: he afterwards

does the same by a second, a third bottle, &c. which he places in the same sloping direction.

Four-and-twenty hours afterwards the workman returns to the plank where he has deposited his bottles; he once more gives them a slight shake, and slopes them a little more, in order to bring the sediment nearer to the cork: if the sediment has then completely fallen down, and the wine is limpid, the workman holds the bottle perpendicularly elevated, and does the same with all the rest of the bottles placed upon the planks: he returns with his hook, uncorks the bottles, and with a dextrous motion of the wrist turns them upside down: the fixed air escapes and pushes out the sediment, which falls into a receiver: the workman then dextrously replaces the bottle upon its end, after allowing nothing to escape, except what is necessary to render it limpid. Another workman then fills it up with good wine, recorks it, and the wine is fit for sale.

By this delicate and cautious operation, the wine loses nothing of its briskness, but occasions a great expense in utensils, fresh corks, wire, labour, &c. It has become necessary, however, of late, since the consumption of Champagne has become so general throughout Europe, and great exertions are made to keep up its celebrity.

XXXIX. *Do the sparkling Wines keep well?*

The wines of Champagne, after being put into circulation, and having travelled about, preserve their good qualities for ten years: but when they are kept in cellars, and particularly in those of Champagne, which are superior from the nature of the soil, (being dug out of beds of chalk,) they will keep for twenty and thirty years.

XL. ***What Degree of Temperature is best adapted for the Preservation of Wines?—Point it out with reference to Reaumur's Thermometer.***

I am well convinced that it is by always preserving an equal temperature that the breaking of the bottles may be avoided when in the cellar. Currents of air passing through the cellars should by all means be prevented: but in order to establish an equal current of air, the cellars should be dug very deep: they, however, would be so expensive that few proprietors could be prevailed on to adopt such a regulation. At Rheims, Ay, Hautvillers, Epernay, Cramant, and Vertus, there are, I have seen, some cellars made upon a most excellent plan, and where no expense has been spared.

I have never tried the temperature of the air of the cellars, and I cannot give any results upon this head.

[Articles 41, 42, 43, 44, and 45, being entirely applicable to the management of wines, will form part of a particular treatise upon the subject of red wines.]

XLVI. ***What is the Price of an Acre of the best Vineyard Ground?*** (The acre being 100 rods and 22 feet.)

At Ay	6000 livres.
Hautvillers	3000
Epernay, Pierry, Avise, Cramant	3000
Other vineyards	2000

XLVII. ***What does an Acre of the Second Quality cost?***

At Ay	3000 livres.
Hautvillers	2500
Epernay, Pierry, Avise, Cramant	2000
And the other vineyards . .	1000

XLVIII. ***What is the Expense of the annual Culture of an Acre of Vineyard, including the Expense of Prunings and of Vintage?***

	Livres.
The ordinary expense of cutting, hoeing, tying, and pruning the vines	80
Expense of occasionally propping up such vines as have fallen, &c.	60
Sixteen or eighteen bundles of props, fifty in each bundle	30
Dung and carriage of the vines, &c.	42
Five empty puncheons for each acre's produce, at ten livres	50
Expense of gathering, pressing, keeping the labourers, &c. &c.	46
	308

Produce of an Acre of Vineyard.

It is generally understood, that, taking the average of ten vintages, five pieces or puncheons of wine are obtained from every acre.

Three of these are of the first quality, or choice wines: and two of them are ordinary wines.

	Livres.
The three puncheons of best wine may be valued at 150 livres each	450
The two others at fifty	100
First result	550
From which we must deduct the expense of bottling and of cooperage at ten livres for each piece of the best wine. The fining of these wines being most expensive	30
For the two other pieces three livres only	6
Annual interest of the money laid out for the ground, &c.	100
Taxes, &c.	72
Labour, &c. as above	308
	516

	Livres.
First result	550
From which deduct as above	516
Net produce of an acre of vineyard in middling years	34

We may easily perceive that the net produce cannot be estimated upon very just and rigorous data, as the wines of Ay, Hautvillers, Epernay, and Pierry, fetch from two hundred to four hundred livres each piece; and a mean price must be fixed for all the other classes of Champagne wines, which sell for ninety up to two hundred livres.

It follows from this statement, that, without great industry, a proprietor can derive but a small profit, who is obliged to sell annually in the cask the produce of his vines: the rich proprietor only, who can afford to put his wines into bottles, and keep them for two or three years, can depend upon a certain and real profit.

In what Manner is the Vine planted in the Mountain?

The vines are planted differently in the mountain and on the banks of the river. The greater part of the vine-growers, who have contracted habits which they will not give up, notwithstanding the inconveniences which they are every day aware of, plant their vines in March only: the shoots they use are either produced from the tall vines which have been beaten, and which have very few roots, or from other plants which spring up among the low vines at the moment of cutting the vines, and which have also very few roots, since they are procured from stalks that have lain on the ground since the commencement of the season.

(To be continued.)

No. 18.

Method of painting Linen Cloth in Oil Colours, to be more pliant, durable, and longer impervious to Water, than in the usual Mode. By Mr. William Anderson, *of His Majesty's Dock-Yard, Portsmouth.**

Sir—I beg leave to lay before the Society of Arts, &c. the following improvements and observations, which I hope will be of service to the public.

Having never heard or read of any method being discovered to prevent paint when laid on canvass from hardening to such a degree as to crack and eventually to break the canvass, and render it unserviceable in a short time; and having been an eye witness for many years of much canvass perishing for want of such discovery, in the immense quantities painted for covering seamen's hammocks, and for other uses on board his majesty's ships; I long had it under consideration to find out such an ingredient as, when mixed with paint, would preserve the canvass and paint laid thereon from the damages above mentioned: and after experiments for a considerable time, I have discovered such an article, and made trial of it with effect above three years.

The canvass I have painted has been submitted to the inspection of the Navy Board, who are so perfectly satisfied with my new method, that general directions are now given to paint all canvass in his majesty's dock-yards in this manner; which, in addition to the advantages I have before mentioned, actually saves an expense of one guinea in every hundred square yards of canvass so painted, as I have fully stated to them. The ingredient I use is not only serviceable for ships' canvass, but also for canvass

* Tilloch, vol. 33, p. 151. From *Transactions of the Society for the Encouragement of Arts, Manufactures, and Commerce*, for 1807.—The silver medal of the Society was voted to Mr. Anderson for this communication.

designed for paintings, for floor cloths, and for painted coverings within and without doors. I have no doubt of it being applied to many other purposes I am yet unacquainted with; as, from actual trials for near four years, I can vouch for its being a preservative to red, yellow, and black paints, when ground in oil and put in casks. When the paints were examined at the expiration of such time, they discovered no improper hardness; but when laid on the work with a brush, they dried in a remarkable manner, without the addition of any of the usual drying articles. I still preserve some of these paints for future trials, and I believe this plan of preserving colours will be of essential use to colourmen, and other persons who purchase colours for exportation. The ingredient I use is perfectly simple, being a solution of yellow soap; and the composition for painting is made in the following manner:

To one pound of soap I add six pints of water in a vessel over the fire; in a few minutes after the boiling of the water the soap will dissolve; whilst hot it is to be mixed with oil paint, prepared as hereafter directed, and is then fit for immediate use. The above quantity of soap solution will be sufficient to mix with one hundred weight of paint. The first coat to be laid upon the canvass is to be entirely of this composition, without first wetting the canvass in the usual way. A very small proportion of it, or none, is necessary in the second coat; and the third coat should be of oil paint alone.

The method heretofore practised in his majesty's dockyards for painting canvass, was as follows: The canvass was first wet with water, then primed with Spanish brown; a second coat given it of a chocolate colour, made from Spanish brown and black paint; and, lastly, finished with black. This mode is destructive, and more expensive than mine in the proportion before mentioned. In

my method, to ninety-six pounds of English ochre ground in boiled oil, I add sixteen pounds of black paint, being one-sixth in proportion of the ochre; this, when mixed, forms an indifferent black. The solution, made of one pound of soap and six pints of water, is to be added to this paint, and well united therewith; and without the canvass being previously wet, this composition is to be laid upon the canvass as stiff as can conveniently be done with the brush, and this first coat will form a tolerably smooth surface. The second coat is to be formed of the same proportion of English ochre and black, without any soap solution; and the third or finishing coat, to be done with black paint as usual. I am, &c.

WILLIAM ANDERSON,
Master Painter of H. M. Dock-Yard at Portsmouth.

Portsea, October 31, 1806.

SIR—Agreeably to the request in your letter, I have enclosed certificates relative to my new method of painting canvass; and I take the liberty of informing you of a method of obtaining from painted canvass, unserviceable, the whole of the colour laid thereon, and to do it at a very small expense. This I discovered since I last wrote to you, and I believe it will be of considerable advantage to government, who, for want of such a thought, have buried and burnt immense quantities of ships' hammock cloths, when found unserviceable, to prevent embezzlement from taking place. I suggested the idea to N. Diddems, esq. builder of Portsmouth yard, who communicated it to the honourable George Grey, commissioner. I obtained leave to make an experiment, which I repeated thrice, and found that from one ton of painted canvass, unserviceable, I obtained, upon an average, four hundred weight of dry

colour, in value to government nine pounds six shillings; the expense of the process not exceeding six shillings.

This I effected by calcination, raking aside the ashes and sprinkling them with water, to prevent loss of paint through excess of heat. By passing the calcined matter through a fine sieve, it is perfectly prepared for grinding; it grinds well, possesses a good body for covering with, and dries well with a good gloss. Its increase of bulk, in comparison with common colour of equal weight, gives it the advantage of covering more work. The colours yielded by the calcination of different coloured canvass are as follow: viz. Canvass which has been painted with black paint only, produces a black colour. Canvass finished black, but which has had a previous red or yellow ground, will produce a dark chocolate colour. Canvass painted lead colour will yield a good dark lead colour. I am, &c.

WILLIAM ANDERSON.

Portsea, March 25, 1807.

To C. TAYLOR, M. D. Sec.

Certificates, dated March, 1807, were received from the following persons, viz.

A. STOW, lieutenant and commander of the gun-brig Steady, stating, that in the preceding month of October he had received on board his ship a set of hammock cloths, painted after the method invented by Mr. William Anderson, which had been constantly in use since the time above mentioned, and appeared fully to answer the end proposed, of rendering the canvass soft and pliable, of preventing its cracking, or the paint peeling off, and which in the old method had been a subject of much complaint.

JOHN PRIDY, lieutenant and commander of the Gladiator, and formerly commander of the Dapper, on which

latter ship a set of hammock cloths, painted after Mr. Anderson's method, appeared fully to answer the end proposed.

P. F. Wyatt, oil and colourman, Portsea, stating that he had seen canvass painted after Mr. Anderson's new method, which, after a trial of sixteen months, remained perfectly soft and pliable, the paint by no means cracking or peeling off, and that the gloss was retained, though it had been exposed to all weathers. He further added, that he had seen the paint prepared by him from old painted canvass found unserviceable, and had worked and painted therewith; that it was, in his judgment, very good, and would answer either on canvass, wood, or iron.

Ns. Diddems, master shipwright, Portsmouth dockyard, stating, that Mr. Anderson had proposed to him to obtain, by calcination, from old unserviceable painted canvass, the paint which had been laid thereon; that such experiment was made, and four hundred weight of dry serviceable paint prepared from one ton of such canvass; that he had seen it when ground in oil and laid on work, when it appeared to possess all the properties of good paint, and had therefore been recommended by him to the Navy Board.

Sir—In answer to your letter of the 25th of April, in which you informed me that the committee were desirous that I should furnish them with a sample of canvass painted in the old method, and another on my improved plan, I trust that I shall be able fully to comply with their request. In the first place, I have sent a small sample of the residuum of the burnt canvass, fit for grinding in oil for paint, also a piece of canvass painted therewith, marked No. 1; another piece painted after the old me-

thod, marked No. 2; another piece painted according to my process, marked No. 3; and, lastly, a piece finished entirely with a new composition, marked No. 4; each sample having received three coats of paint. Upon examining No. 2, you will find it becoming from time to time more stubborn, in consequence of the paint hardening; and when a small ridge is formed in it, by pressing it between the finger and thumb, it will soon discover that it is subject to crack, and by this means, permitting the wet to enter it, will soon rot the canvass.

The space of time proper between laying on the new preparation and the second coat, ought to be one entire day; but if saving time is an object, the second coat may be put on the day following the first; for, if the canvass is placed in an advantageous situation for drying, the composition will dry or harden so as not to rub off.

Canvass finished entirely with the composition, leaving it to dry one day between each coat, will not stick together if laid in quantities, as you will find by making experiments on the sample No. 4.

Since the Navy Board have given directions for ship's canvass to be painted according to my method, I find, upon calculation, that I have painted upwards of twenty thousand yards since November last, a great part of which has not been hung up for painting and drying more than one week, as no more time could be allowed me, in consequence of ships sailing. My plan was therefore to lay on the composition the first day, to coat it the second day, and, leaving one intermediate day, to finish it on the fourth. Three days were then allowed it to dry and harden; and when afterwards taken down and folded together in cloths, containing sixty or seventy yards, they did not stick together.

Having no means of giving information to persons concerned in grinding colours, so well as through the me-

dium of the Society of Arts, &c. I beg leave further to relate how I have, for the last three years, saved the labour of three men out of four in grinding colours with the common mills employed for that purpose. One mill has ever been considered sufficient for a man to turn, whereas one man can now, with perfect ease, turn four mills; this is effected by placing two mills on each side of the winch, so close as only to leave room for the fly wheel to play between them. The spindles of each on either side are locked together by a small iron collar, with a pin passing through it. The distance of the mills thus paired from each other, in order for the man's standing between them to turn, is two feet six inches. The distance of the arms of the winch screwed on the end of the spindles on either side, is two feet two inches; the length of the arm is one foot six inches from the spindles to the bar across which the man clasps in order to turn.

Fly wheels at the extremity are impediments. Necessity was truly the mother of invention to me in this case, as I had great demand for paint, and I was not allowed men sufficient for the work in the common way.

Persons will scarcely believe, without seeing the experiment, the ease with which they turn. If a little extraordinary motion is first given them, and they are then left alone, they will continue to go round sixteen times; so that a man with one hand may turn them. I am, &c.

WILLIAM ANDERSON.

Portsea, May 6, 1807.

To C. TAYLOR, M. D. Sec.

SIR—I have stated to the Admiralty Board the several improvements made by me in paint work; and in consequence thereof they have desired the principal officers of our yard to report to them on their merits. The offi-

cers, who have for more than twelve months past daily had the execution of them under their inspection, have recommended the same in stronger terms, and the advantages thereof, to the lords commissioners, beyond my statement. I have enclosed to you a certificate relative to the ship Hibernia, which arrived here the 12th of May last, and for which vessel I painted a set of hammock cloths, containing thirteen hundred yards of canvass, in June 1806, after my new method. I am, &c.

WILLIAM ANDERSON.

Portsmouth, Nov. 27, 1807.

To C. TAYLOR, M. D. Sec.

NO. 20.

Description of a Revolving Telegraph, for conveying Intelligence by Figures, Letters, Words, or Sentences. *By* JOHN REDMAN COXE.

[With an engraving.)

In the construction of a telegraph, it must be obvious that certain principles are to be kept in view. These are,

1. That the signals should be few, plain, and readily perceptible.

2. That the machine itself should be of a nature to combine strength, durability, and easy execution.

3. That it should be susceptible of being worked with facility, exactness, and despatch.

With respect to most of the telegraphs of which we have any account, some will be found to possess some of these points, whilst they are deficient in others; and it is not too much, perhaps, to assert, that not one is altogether possessed of every qualification, which shall render this machine extensively useful.

Without hoping that the one I am about to describe is free from every objection, I am disposed to regard it as more perfect than any one in present use; and I would flatter myself, that the principles on which it is constructed, may, by experience, be so much improved upon, as to prove it really the important instrument of communication the name implies.

A cursory view of the accompanying engraving, will give a general idea of its formation, so as to render the description easily to be understood.

This machine consists of a semicircle of any required magnitude, raised upon and firmly fixed to a strong wooden frame, four, six, or eight feet high, by means of iron rods or radii. To this frame is connected a strong upright shaft of wood or iron, passing through the lower horizontal beam, and having attached at this part a perforated shoulder, for the passage of the ropes from the machine to the observatory below. This shoulder is firmly fixed in the beam; but is continued downwards a sufficient distance to rotate in a circular opening of the roof of the building, the shaft itself reaching to the bottom of the chamber, and is there received in a socket in which it plays. The object of this contrivance is, to permit the rotation of the telegraph without any obstruction to the free play of the ropes. The rotation, though in part effected by the shaft, is more especially dependant upon two or more strong iron castors, or rollers, sunk into the lower beam on each side the centre, and running on horizontal circles of iron let into the roof. The shaft preserves the machine in its proper situation.

The frame is so constructed as to permit a strong iron cap to be fixed to the head of the shaft, which branches out into two arms, to form the centres, in which the axes of the wheels of the telegraph freely rotate. Of these axes, the one, interior and solid, passes through the other,

which is a cylindrical tube. Of the two wheels which work the shutters of the windows of the telegraph, the *outer* one is fixed to the solid axis, which, at the further extremity, where it passes out from the hollow axis, has a short upright, to which is attached a returning arm, running parallel with the axis, and having at the extremity one of the shutters dovetailed into it; beneath this, a friction roller plays upon the periphery of the hollow axis, thereby supporting the weight of the shutter, and facilitating the motion. The *inner* wheel is connected to the edge of the hollow axis, and has the second shutter morticed firmly into its interior edge, so that it plays exterior to the first shutter, as closely as the parts will admit; and to prevent any interruption from each other, a narrow semicircular rim along the edge of the telegraph may be adapted, to preserve each in its line of motion.

These shutters are formed of thin well seasoned plank, sheathed with copper or tin plates, or the shoulders may be small iron rods, terminating in broad paddles of an appropriate form. The wheels which work them may be of any size that experience shall direct, probably about one third in diameter, of that of the semicircle constituting the telegraph.

The telegraph itself is formed of two parallel semicircular sheets of iron or copper, of six inches or a foot wide, situated about two, three, or four feet apart, (more or less, according to the size of the machine, and as experience may approve,) and divided into thirteen equal chambers, all being accurately closed before and behind; an opening or window being cut in each chamber on both sides, of such a size as readily to be seen at the stations next adjoining, by the free passage of the light; a sufficient interval between each opening being preserved, to render the windows accurately defined: to make the bright appearance of the windows more conspicuous, eve-

ry part of the machine may be painted black,—the wheels, shutters, frame, and even the whole inferior semicircular space.

The ropes that move the wheels, (by which the shutters are made to close the window required,) are carried down into the observatory by appropriate pulleys, and through openings in the lower beam and shoulder of the shaft. These ropes are divided accurately by spaces equal to the thirteenth part of the diameter of the wheels, and are to be numbered 1, 2, 3, 4, &c. corresponding with the thirteen chambers in such a way, that the two ropes which go to one wheel may have the order reversed, so that by bringing down a particular number of the rope to a fixed point on the shaft, we shall know the corresponding window above, is closed by the shutter, connected with the wheel we are turning. The double numbering of the ropes may, perhaps, be obviated, by attaching to one of them a weight sufficient to draw back the shutter to its point of departure; in which case, the shutter will always remain below the range of windows, unless the opposing rope is pulled by the observer, to the point desired.

To employ this telegraph by night (which, however, is rarely requisite), lamps are placed within the chambers, and the intensity of the light hereby produced, is greatly augmented by lenses fitted to the windows. These might be fixed in a semicircular frame, which could be made to sink during the day below the range of windows. If used by night, four shutters must be employed (two on each side) to obstruct as necessary, the light from the adjoining station on either side.

Over the central window of the telegraph is fixed a sheet iron or copper parallelogram, or tower, six, eight, or ten feet high, of equal width with the machine. This is divided into three or more chambers, the lowest one blank, for the reception of blinds running in appropriate

grooves, and falling into the blank chamber by their own weight. They are raised by means of ropes passing over pullies in proper situations, and running down into the observatory. The upper chambers of this case have circular openings or windows, of two or more feet in diameter, which are closed as occasion requires by the above mentioned blinds. At night, lamps are to be fixed in the chambers; and, as one or other light, or the whole number, are obscured, so signals are constituted distinct from those of the telegraph itself. The United States' flag may surmount this tower, and may, if necessary, be made accessory to the general communication.

It is scarcely necessary to mention, that the machine must be sufficiently elevated above all adjoining buildings, so as to be conspicuous in every point to which it may be revolved.

When the machine is fixed permanently in a large town, the building on which it is elevated would be perhaps best constructed of an hexagonal or octagonal form, by which means, as many windows of observation may be connected with the observatory; and, if the room is made of brick or stone, it might be easily vaulted, so as to secure it from fire, (which might destroy the machine above,) and render the circles of rotation in the roof, more solid and secure.

The rotation of the machine is easily accomplished in the observatory by one or two persons, by means of an horizontal bar passing through the shaft.

The advantages of this telegraph, I conceive to be

1. Its simplicity; for by the proper obscuration of the thirteen chambers of the semicircle, all the letters of the alphabet, &c. may be signified. It is, I think, capable of being effected with one shutter only, in place of two, as above recommended, even *without* the upper case or tower, but certainly in conjunction with it. I have not, however, matured the plan completely.

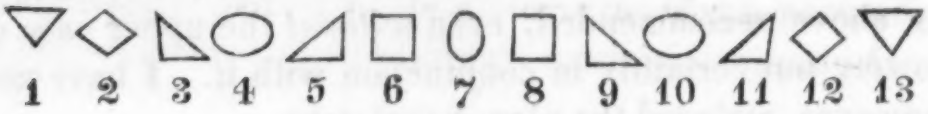
2. By its capability of rotation, one machine is adequate to convey signals from a centre to every point of the compass; and hence is peculiarly adapted for large towns, especially for our seats of government.

3. By the mutations of which it is capable, it is impossible to detect the intelligence communicated; for signals can be equally adapted to figures, letters, words, or sentences, and the key may be changed ad infinitum.

4. By a slight modification it would probably be well adapted to vessels of war, as a permanent or temporary appendage to one of the upper yards. Six chambers, in place of thirteen, would, I think, supply every requisite signal, particularly with the aid of a few flags; or the upper case or tower alone, with an increased number of circular windows might readily be elevated at the summit of the mast, or be carried out to the extremity of a yard, as the steering sails are, by means of a boom, and no doubt by the changes that could be made, would answer every object at sea.

I have gone upon the supposition, in the account of the above machine, that all the windows in the semicircle are exactly similar; as I have heard it objected, that some difficulties might arise in the signals by a mistake in the observer of the chamber closed, I shall point out a mode by which this may be obviated, although this must arise from inexperience and inattention, and is therefore on a footing with the possible mistakes of every other telegraph.

My plan is the following: To have each chamber differently constructed on each side the central one. Thus suppose the central chamber to be circular, the others might be as follow:



From the great difference between each, it can scarcely be supposed that chambers thus formed, if three, four, or five feet large, would not be sufficiently conspicuous at the greatest distance that telegraphic signals are communicated. It must be persons totally unfit for the situation, who could not easily acquire a knowledge of the chamber obscured. I say nothing further on this point, since experience perhaps is required to know exactly what figures are best adapted for distant view; and it is only general principles I propose to establish throughout, which may serve as foundations for practical experiments.

I shall now equally in a general point of view, give an idea of the manner of making or rather constituting the signals, since it will altogether depend on the arrangements agreed on in the key of the communications.

I shall suppose the hour of communication arrived;—(it will probably be best to have certain fixed periods of communication;) the signal of commencement is hoisted throughout the line, successively, from first to last, none withdrawing his, until the station in advance has elevated it. This signal might consist of the flag of the Union, were it not for the wind being often unfavourable to its proper display: hence, perhaps, it will be better to blind the upper chamber of the parallelogram or tower. This signal being made and withdrawn, the lower chamber may be darkened to signify figures, or both chambers may be darkened to imply letters, as the medium of correspondence. These preliminaries being settled, requiring no more time than is requisite to hoist the blinds, and ascertain if the next in succession has answered them, the same chambers serve now another purpose in the progress of correspondence. Thus the upper chamber closed, implies the signal of error, and, of course, a repetition of

the prior signal. The closure of the lower chamber implies a stop between each word or number.

The thirteen chambers of the telegraph are numbered from one to thirteen. When number one is obscured, by raising the paddle or shutter from its rest, below the boundary of the semicircle, the letter *a* is implied; number two obscured, means *b*; and so on till the completion of the first thirteen letters of the alphabet. The second shutter now comes into play, and the residuary letters are constructed by keeping the number 13 permanently closed, and resuming the revolution of the first shutter. The following table demonstrates the meaning.

A	by shutting	1	O	shutting 1–13	permanent.
B	. . .	2	P	. . 2	Do.
C	. . .	3	Q	. . 3	Do.
D	. . .	4	R	. . 4	Do.
E	. . .	5	S	. . 5	Do.
F	. . .	6	T	. . 6	Do.
G	. . .	7	U	. . 7	Do.
H	. . .	8	V	. . 8	Do.
I	. . .	9	W	. . 9	Do.
K	. . .	10	X	. . 10	Do.
L	. . .	11	Y	. . 11	Do.
M	. . .	12	Z	. . 12	Do.
N	. . .	13			

I have said that one paddle might suffice by some proper contrivance; I shall merely hint that the intention of the second paddle, which is here to obscure number thirteen, according to the agreement of the parties, may be supplied by a flag hoisted to the right or left, or by shutting a window in the chamber above, or in various other ways, which ingenuity might contrive, so that A and O, B and P, C and Q, &c. should be constituted by the same signal of closing number one, two, or three, &c. with some slight addition or subtraction in the latter case.

If figures are the medium of communication, then one to ten respectively designate the decimal figures. Eleven may represent 0; twelve, 100; thirteen, 1000; and each may be read as shall be agreed on. Thus a dictionary of words or sentences, numbered to any amount, may be constituted, in which such as are not often necessary may be omitted altogether. Now, by giving such a particular number, all that is required is to look for that number, and we have the corresponding word or sentence. The figures may be written down of each number as found; thus, 1250;—number 13, one thousand; number 2, two; number 12, hundred; number 5, five; number 11, 0. By this or other means which experience may suggest, any number may be readily found, and the corresponding sense discovered. The key of this system may be easily changed daily, weekly, &c. by adding to, or subtracting from the number found, a certain specified number; as ten, twenty, thirty, &c. and regarding the residuary number as the one to be looked for in the telegraphic dictionary.

It will readily be seen, that I have only here given a slight outline of the nature of the mode of communication, leaving it to those who may consider the subject practically, to fix upon the plan best adapted to their intentions.

I have only to add, that I have constructed a small telegraph upon the above plan, about one sixth the natural size, (which I have supposed to be twelve feet,) that works readily and appropriately, although by no means fitted with the various pullies, &c. to facilitate the motion of the ropes. The engraving made from a drawing of this model, is on a scale of about three eighths of an inch to a foot.

Explanation of the Plate.

FIG. 1, Plate 3,—Geometrical elevation of the telegraph, seen from behind, with a perpendicular section of the chamber of observation. One half of the telegraph and frame is seen covered with black cloth, or painted, leaving only the windows of the chamber permeable to the passage of light. This back part of the telegraph chambers, when complete, is equally covered with the front. It is left unfinished here to permit the view of the different chambers.

ABCD, the frame on which the telegraph is raised.

EF, the semicircular frames of iron or copper, subdivided into 13 chambers.

G, the rods or radii supporting it on the wooden frame.

H, the shaft passing through the lower beam CD into the observatory, and playing in the socket *a*.

I, the shoulder attached to the shaft, and fixed firmly in the beam, its lower part playing in a circular opening of the roof. The ropes *b*, *c*, are seen descending from one of the wheels, through the perforations of the beam and shoulder.

dd, iron castors or rollers sunk into the beam, on which the telegraph and frame rotate in horizontal circles on the roof.

K, the iron cap on the top of the shaft, branching out into the arms which support the axes of the wheels, the inner one of which,

L, is here seen, having a shutter *e*, morticed firmly into its interior surface. The other shutter *f*, is seen covering, on the off side, one of the chambers of the telegraph, and is attached to the returning arm of the solid axis. This is more clearly seen in fig. 2.

M, the tower or parallelogram raised above the telegraph; divided into three chambers, one of which is

Cove's Revolving Telegraph

Fig.1.

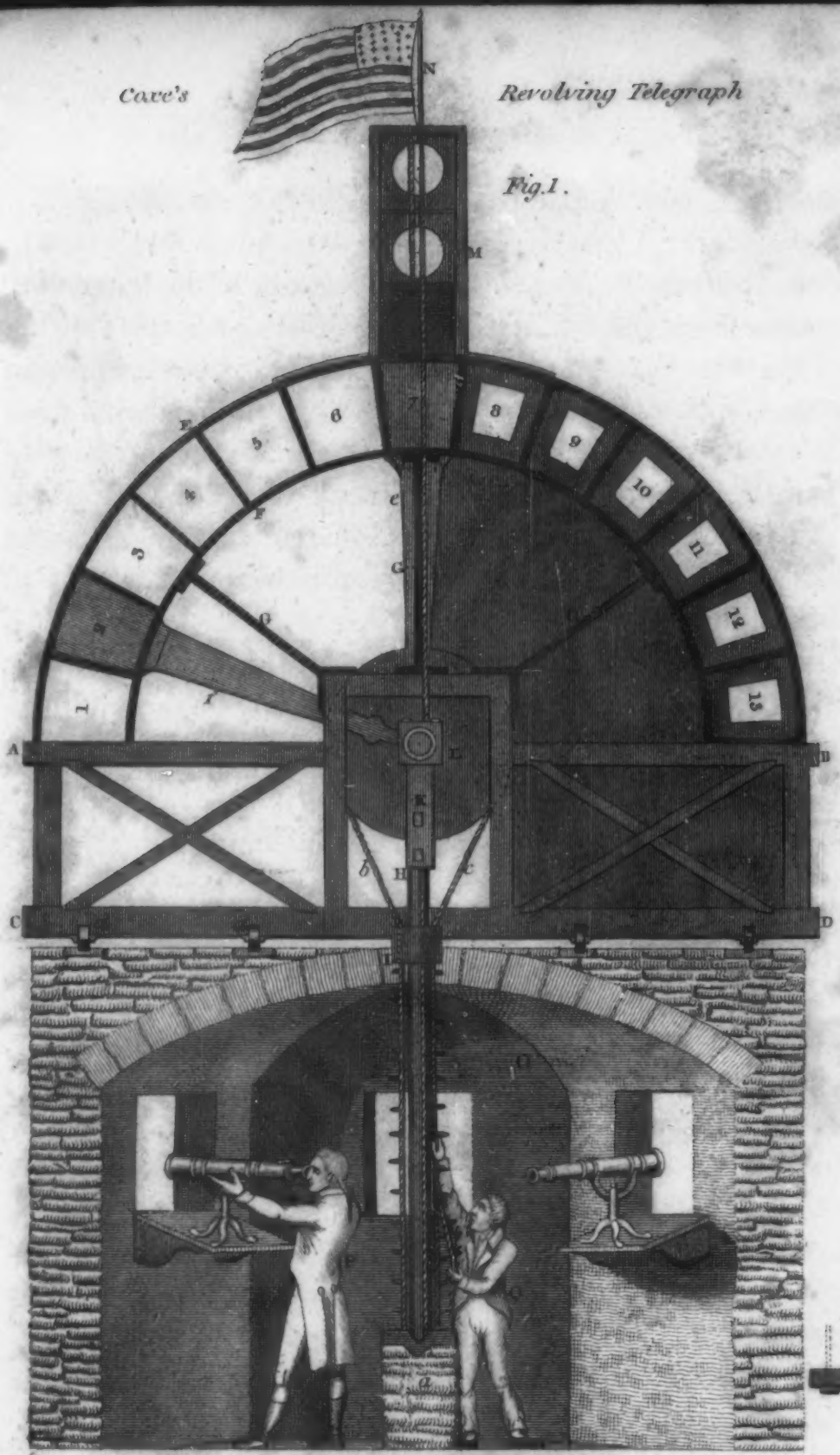
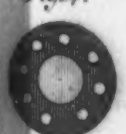


Fig.3.

Fig.4.



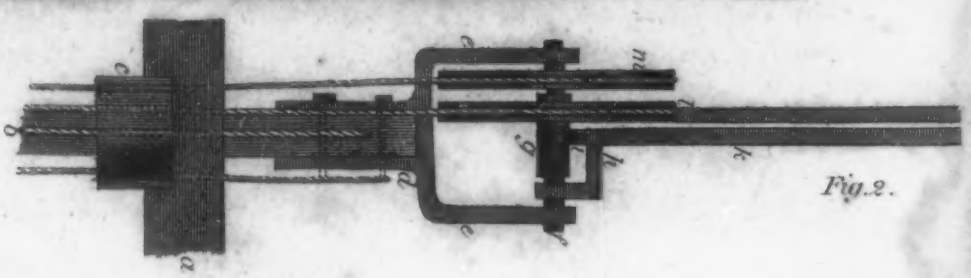


Fig.2.

Emporium of Arts and Sciences Vol.2. Pl.3.

blank, to receive the shutters covering the windows, which fall back by their own weight. The ropes which hoist them are seen passing over pullies, and down into the observatory, through the perforated beam and shoulder.

N, a flag, surmounting the whole, to be occasionally used for signals.

O, the observatory.

P, the signal officer.

Q, the workman employed in pulling the ropes to constitute the signals, as ordered by the officer at the telescope.

The ropes are divided into 13 spaces, corresponding with the 13 chambers of the telegraph; by pulling either of which to a fixed point, such or such a window is obscured.

Fig. 2. *a*, the lower beam of the frame, with the shaft *b*, passing through it, and having the shoulder *c*, connected: The openings for the ropes are here seen in them. *d*, the iron cap; *e e*, the arms supporting the axes: *f*, the solid axis passing through the hollow axis *g*; *h*, the upright, and returning parallel arm of the solid axis, playing on the periphery of the hollow axis with a friction roller *i*.

k, the arm of one of the shutters attached to the returning arm.

l, the inner wheel, (with a shutter morticed into its interior surface,) attached to the rim of the hollow axis.

m, the outer wheel, fixed to the solid axis, by which the shutter *k* is worked.

Fig. 3, an enlarged view of one of the castors on which the telegraph rotates.

Fig. 4, section of the shaft and shoulder, showing the manner of constructing the holes for the passage of the ropes, by which they work freely, without being impeded by the rotation of the machine.

No. 21.

Description of a Method of connecting Iron Bars, and coating them with Lead, so as to form solid Pillars for Light Houses on Rocks covered at High Water, and to defend them from Corrosion. By Captain Joseph Brodie, *of the Royal Navy.**

(With an engraving.)

FIG. 1, Plate 4, A, shows four rods of cast iron, composed of a number of pieces two feet long, rivetted together in a manner explained by the plate, so as to produce the effect of one bar of the thickness of the whole. B, a tube of cast iron, formed from a number of separate pieces, each about ten inches long, and which, when placed round the iron rods above mentioned, and then screwed together, form a mould, into which the melted lead is to be poured, to coat the iron rods. C. A portion of the rods covered with the melted lead, so as to form a cylindrical pillar apparently of lead, the iron being perfectly coated therewith.

Fig. 2. D shows the manner in which the hollow cylinder is formed to any length required, by the junction of a number of semi-cylinders rivetted together and fitting each other. E, the side flanges screwed close together. F, the end flanges also screwed together, as prepared for the melted lead.

After a certain portion of the iron rods are coated with lead, the lower parts of the tube are taken off and placed higher up; by which repeated changes, a few tubes will answer the purpose to coat any length of the iron rods.

* Nicholson, vol. 11, p. 108. Communicated to the Society of Arts, (Memoirs, MDCCCIV. 258.) who voted him the gold medal.

No. 22.

Description and Use of a Sea Log, and Sounding Machine, invented by Mr. Edward Massey, *of Hanley, in Staffordshire.**

(With an engraving.)

TO the nautical reader the advantages resulting from a log, that will give a dead reckoning free from error, or nearly so, must be sufficiently obvious; and to others it would be superfluous to point them out. The principle, on which Mr. Massey's patent log is constructed, is not new; but every application of it to practice has been found defective, and this is the difficulty the patentee has had to surmount. To understand the manner in which it acts, see Plate 4, where *a*, fig. 3, is that part of the log which registers the distance sailed, and is therefore called the register; it contains within itself a set of wheel work, which operates upon the fingers of the several indices, 1, 2, and 3. *b* is the rotator, a hollow cylinder, made air tight, and so nearly of the same specific gravity as water, as to float when drawn forwards with the velocity of mere steerage way. On this rotator are fixed four vanes placed obliquely. It is then fastened to the register by a cord, *c*, about six feet long:† to the loop hole at the other end of the register is secured another line, *e*, of sufficient length to extend beyond the eddy of the vessel's wake.

The finger on the index 1 revolves once while the log moves forward one mile; that on the index 2 moves once round in going ten miles; that on the index 3 makes one

* Nicholson, vol. 21, p. 245.

† This cord is shown scarcely one tenth part of its proper length in the engraving: it would have been an unnecessary extension of the plate to represent it otherwise, as it may so readily be conceived.

revolution when the distance sailed is one hundred miles. When the machine is to be used, all the fingers of the indices are set to 0, and both register and rotator committed to the water.

As the vessel moves forward, the log must follow, and from the obliquity of the vanes it is evident the rotator, *b*, must revolve quicker or slower, correspondent to the ship's velocity. This rotatory motion is communicated by the cord *c* to the universal joint *d*, connected with the wheels, which consequently revolve with the rotator and cord, and thus the actual space passed through, in any given time, is registered on the indices.

Every occasional or momentary acceleration or retardation of the vessel, from irregularity of wind, or other causes, which are either altogether passed over, or very vaguely guessed at, in general, are accurately registered on this machine, which not only gives the actual rate of sailing, but the actual distance sailed, since the last inspection.

A very little reflection will convince any observer of the great superiority of this machine over all others which have been hitherto introduced.

It may appear rather presumptuous to criticise the labours of Smeaton, and many others, whose endeavours were not crowned with complete success: but it is necessary to point out where their plans failed, in order to prove the very superior advantages of Massey's log; for though some of the machines answered their purposes tolerably well under certain circumstances, none of them were nearly correct under all circumstances. Some were erroneous when the ship moved less than four miles in the hour, and others became so when the rate was increased.

In most of the former inventions, the first mover was a spiral, or a rotator in the shape of a Y, and was generally attached to a register kept in the ship; and as it was ab-

solutely necessary, that this first mover should be out of the wake of the vessel, it had a length of fifty yards of cord, or more, to carry round with it every time it revolved. The friction caused by this operation was such as to preclude all hopes of accuracy; it was useless in an agitated sea, the rope was very liable to kink, and in fast sailing the rotator would sometimes fly out of the water.* These circumstances rendered it impossible, that the rotator should make the same number of revolutions in passing through a given space, under different velocities; and hence inaccuracy was unavoidable. To get rid of this friction of the long line, the rotator has, in some instances, been enclosed in a cylinder, and a register been attached to the outside. But though the defect of excessive friction was thus surmounted, still greater inconveniences resulted. It may be sufficient to mention, that the cylinder, not presenting itself horizontally in the water, was liable to alter its position whenever the velocity of the vessel was changed, which caused an eddy, or dead water, to remain in the cylinder; and, of course, the rotator was liable to err, in proportion as the cylinder lost its horizontal position.

After thus hinting at the imperfections of other previous methods of constructing logs, it remains to point out wherein Massey's plan differs.

Friction is the principle cause of mechanical theories varying so widely from actual experiment. In some machines one third is allowed for its effect, while the operation in others is nearly suspended, and what appeared

* Smeaton, in the account of his experiments on Saumarez's log, in the Philosophical Transactions, observes on this subject: "Upon making up the account of this run, I found the number of rotations were less by one full third than they ought to have been, compared with the former observations, which afforded me a convincing proof, that this instrument was considerably retarded in quick motions."

very plausible in theory, is found totally useless in practice. Thus the friction on a rope long enough to extend beyond the eddy of the vessel's wake would, in many circumstances, on the old plan, totally impede the action of the rotator.* Under this impression, the friction in Massey's patent log is reduced to almost nothing by the following simple contrivance. The whole log, consisting of the register, *a*, connecting cord, *c*, and the rotator, *b*, is committed to the water, by a log line of sufficient length to reach beyond the eddy of the vessel's wake. As the ship moves forwards, the rotator, and cord, *c*, between it and the register, revolve and set the wheels into motion; nor has the roughest sea been found to prevent this action.

The rotator also, in this log, is so constructed as always to preserve a horizontal position, by being made nearly of the same specific gravity as water; which is effected by means of an air tube passing through its centre: an indispensible requisite, which no former machine possessed; and for the want of which, they could not preserve that horizontal position in fast and slow sailing, which is absolutely necessary to obtain any true result.

Another very important improvement consists in the contrivance for regulating the rotator, by which means every rotator revolves once on its axis in passing the same space: as it was found utterly impossible to construct two rotators so exactly alike as stated by Smeaton, without means of adjustment.

To sum up the properties of Massey's patent log, in a few words it may be observed,

* Smeaton, in the account of his experiments, in the work before quoted, observes: "During this run, I observed that the resistance of the water to the line and plate was very considerable, and increased the friction of the spindle so much, as to prevent it from beginning to turn, till the plate had twisted the line to such a degree, that when it did set a going it would frequently run one hundred and fifty or two hundred turns at once."

1. It will give the true distance sailed, from steerage way, to any velocity with which the swiftest sailing vessel can move.

2. It not only gives more accurately than the common log the rate of sailing, but the actual space sailed through since the last inspection.

3. It is attended with less trouble than the common log, and no mistakes can possibly arise from the result it gives.

It remains to point out one great and desirable advantage, which may very reasonably be expected to result from the use of this log, and that is, a more complete knowledge of the currents in various parts of the ocean, which has hitherto been very imperfectly attained; as it was not possible to know, with any certainty, whether the wide difference found between the real distance, and that given by the common log, was caused by the known imperfections of that method of reckoning, or by the operation of currents.

Dr. Maskelyne, in the same work just quoted, further observes: "There is another argument which adds much strength to the foregoing ones, and greatly enforces a uniform and correct length of the logline, on board all ships; that in many parts of the ocean, especially between the tropics, and near most head-lands, there are considerable currents, which must introduce a fresh error into the reckoning; and if this error should happen to combine with that already produced by a wrong length of the logline, as it may as well as not, it is not easy to say how far the total error of the reckoning might go, or to what inconveniences or dangers the ship might be exposed on that account. But if the just and proper length of the logline were used on board of all ships, they would be then liable only to the errors of the currents themselves; and even these, as far as they are con-

stant and regular, might be found out and ascertained, from the journals of several ships, which would then agree much nearer with one another." And Smeaton observes, that "it is for want of a means of measuring the way of a ship through the water, (and this compared with other check observations,) that the drift and velocities of the principal currents have not already been determined."

But admitting the common logline and glass were perfectly uniform in each ship of a fleet, yet the result would still be too erroneous to expect this very desirable knowledge of the currents to be derived from a comparison of the several journals. Massey's patent log holds out, however, more than a probability of effecting this important end. It appears by a letter from captain Whittle, of the Lord Nelson, that he found the distance run from the island of Ila, to Saint Johns' harbour, Newfoundland, by Massey's log, to agree with the known latitudes and longitudes of both places, within eight miles. Now had he sailed in company with several other ships, supplied with the same log, which had kept tolerably well together during the whole voyage, and it had been found (which is more than probable) that all their reckonings corresponded with his; the difference between the true distance, and the distance given by the log, might with the greatest propriety be ascribed to the operation of currents; the existence of which would consequently be discovered, as far as related to those seas.

The importance of obtaining true soundings at sea must be admitted by every seamen; and it is rather singular, that no other method than the common lead has hitherto been brought into use; as its imperfections are very generally acknowledged.

Many vessels have been lost, by depending upon the soundings taken in the usual way. The difficulty of ob-

taining the true perpendicular, and the uncertainty as to the exact moment when the lead strikes the bottom, upon which the accuracy of the result depends, must always prevent the possibility of obtaining the true depth, while the ship has any considerable way upon her. Indeed, it has been acknowledged by experienced seamen, during some experiments, made at various times, in the river Mersey, that they could not depend upon the common lead, when going five or six knots in the hour, in ten or twelve fathoms of water. When the depth is considerable, the vessel must be hove to, which is an operation attended with great loss of time, and sometimes considerable injury to the sails; and during a chase, this inconvenience must be particularly felt.

Massey's sounding machine is as great an improvement upon the common lead, as his patent log is upon the common log. A rotator on the same principle as that to the log registers the perpendicular descent of the lead, without any respect to the length of line paid out, which, in the usual method of taking soundings, is the chief guide to the mariner in judging of the perpendicular depth, and is apt to deceive him much.

True soundings may be taken with this machine in thirty fathoms water, without the trouble of heaving the vessel to, although she may be going at the rate of six miles in the hour. True soundings may also thus be obtained in very deep water, where it is not possible to take them by the common lead.

This sounding machine is on the same principle as the log, for it is evident, that, if the end *e* of the register, *a*, (*fig.* 3,) were projected into the water, and suffered to descend, the rotator would follow, and register the exact depth, as well in a perpendicular, as in a horizontal position.

But though the principle of the two machines is the same, their construction necessarily differs considerably, as will be perceived on reference to the plate.

Fig. 4, represents the sounding machine. *a* is the sounding weight, containing a register, 1, 2, with two dials: the hand of the dial 1 makes one revolution when the weight has descended twenty fathoms, the other revolves once when the descent amounts to five hundred fathoms. A rotator, *b*, similar to that attached to the log, communicates with the wheel work of the dials 1, 2, by means of the rod *c*, on which there are three universal joints, 3, 4, and 5. This rod is supported during the descent of the weight, by the drop, *d*, at the end of which is a fork, 6, and a friction wheel, 7.

When the machine is to be used, a sounding line is fastened to the ring, *e*; and one of the vanes of the rotator is slipped into the spring 8: the rotator will then be in the position indicated by the dotted lines, *x*. The indices must be set at 0, and the cover or lid, *f*, be shut. The machine must then be projected perpendicularly into the sea. As soon as it reaches the surface, the resistance of the water forces the dotted rotator, *x*, out of the spring 8, and it assumes its perpendicular direction as represented by the rotator *b*. As the machine descends, it is evident the rotator will revolve, and its motion be communicated freely past the friction wheel 7, and the universal joint 5, to the wheel work of the dials 1, 2, and thus indicate the space passed through in fathoms. When the machine has arrived at the bottom, the rotator, as it is no longer buoyed up by the reaction of the water, will fall to the bottom, quitting the fork of the drop *d*, which will also fall from its horizontal position, and in its descent, by means of the locking rod 9, prevent the rotator from revolving as the machine is drawn up. When at the bot-

tom, the rotator will be in the position of the dotted lines *y*.

This machine, simple in its construction, and scarcely more liable to accident than the common lead, ascertains, with the utmost precision, the perpendicular depth, by the mere act of descent through the water. No mistake can arise from that common source of error, the drift or leeway of the ship during the time of descent; nor does an operation of such importance depend upon the uncertain sensation caused by the lead striking the bottom, on which the accuracy of the common log altogether depends, and which, it is well known, frequently and materially misleads the best seamen: for though a thousand fathoms of line were paid out, in the smallest depth of water, no inaccuracy could arise, as the perpendicular depth, at the point of heaving, would be registered on the index. The only inconvenience experienced would be the additional labour necessary for hauling in the excess of line. The most inexperienced persons may use this machine, without risk of error, in the most turbulent sea, and during the night.

The advantages already enumerated would render the sounding machine of great importance; but there are other properties of still more consequence.

To heave a ship to, in order to obtain soundings, on a lee shore, in stormy weather, is a very disagreeable operation, attended with much trouble, and loss of way; also with considerable danger to the ship's sails; indeed, it would often, under such circumstances, be attended with great hazard to the safety of the ship. To avoid these unpleasant consequences, the master sometimes adopts a measure, which he conceives to be the less exceptionable alternative, by running on without sounding at all.

To prove how much inconvenience and danger are avoided by Massey's lead, it is enough to state, that soundings may be taken in depth from sixty to eighty fathoms, while the ship is under way, at the rate of three miles an hour; and as the rate of sailing may be still materially reduced, without entirely stopping the vessel, or altering her course, so may soundings be had, to any depth required, while she is under way.

In order more clearly to show the superiority of this machine, and make it apparent, that the quantity of strayline veered out does not at all affect the truth of the result: suppose the common lead thrown from the mizen chains of the ship, which may be represented by the point *a* of the triangle *a b c*, (fig. 5,) and that the ship has moved forwards through the space equal to the line *b c*, while the lead has descended through the line *a c*; it is evident, that it is impossible, in this case, to ascertain the exact depth, as a quantity of line, equal to *a b*, would be paid out, whereas the true depth is equal only to the line *a c*, which is much less. But the case is very different when the patent sounding machine is used, as the operation ceases when it has reached the bottom; nor is the strayline, *a b*, whatever its length, at all taken into the account.

It has been found extremely difficult, and sometimes impossible, to obtain soundings in very deep water with the common lead, which may perhaps be thus accounted for. The common line which is used for sounding, though, if left to itself, it would sink in water, yet its descent would be much slower than that of the lead, separately; it consequently follows, that the lead must be so much impeded by carrying the line with it, that when it does reach the bottom, there will be scarcely any sensible check to enable the seaman to know the precise moment. Indeed, if he can ascertain even this to a certain-

Captain Brodie's Method of Loading Iron Bars.

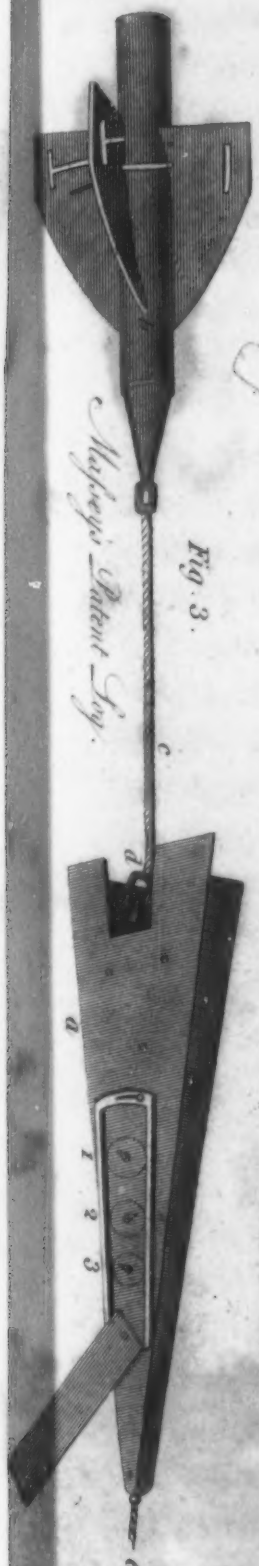


Fig. 3.

Mafseys Patent Log.

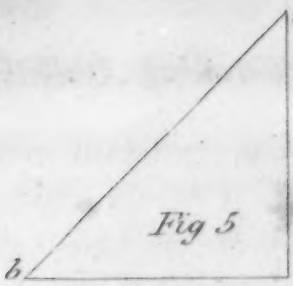
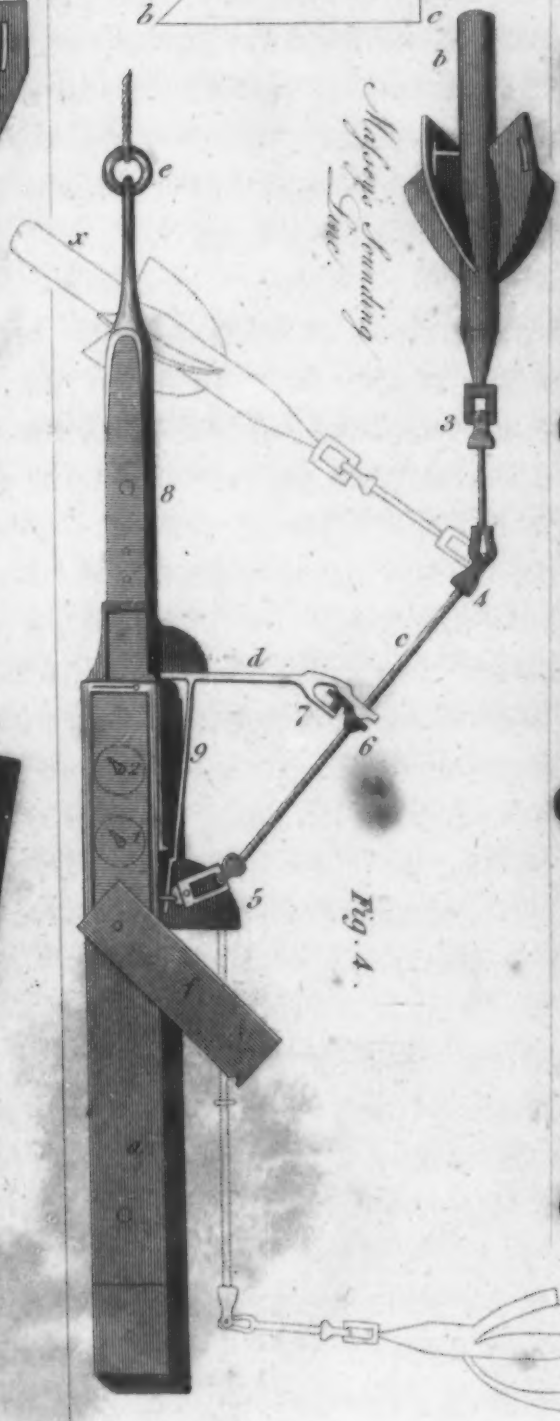


Fig. 5



Mafseys Sounding Line.

Fig. 4.

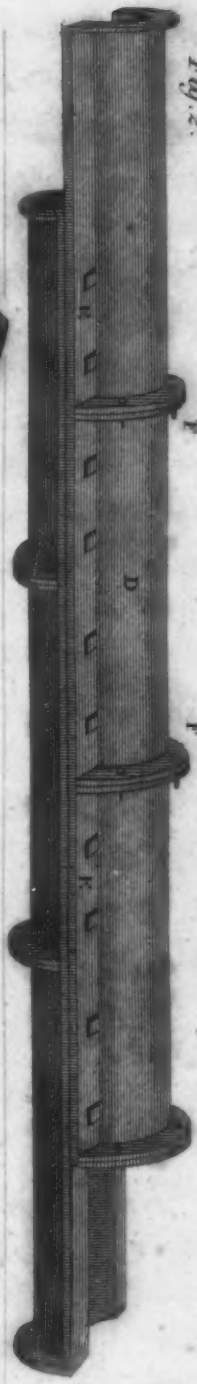


Fig. 2.

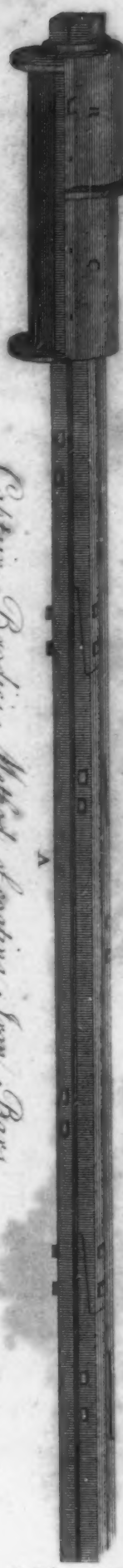


Fig. 1.

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C. Trebout

ty, he still cannot depend upon the truth of his soundings; for if there be the least drift or current, the line itself will assume a curve, similar to that of the line of a kite in the air. These two causes will always operate against the perfection of the common mode of sounding.

After so fully describing the principle of the patent sounding machine, it is scarcely necessary to prove, that it is liable to neither of the foregoing objections; and it may be sufficient to say, that, as it will certainly find its way to the bottom, if a sufficient portion of stray-line be allowed to guard against its being checked in its progress, and the certainty of its having reached the bottom may be ascertained by the arming, there can be no doubt of the practicability of its obtaining soundings, in any depth, and no reasonable doubt of their correctness when obtained.

From the construction of this machine, it might be imagined, that the rotator would impede its motion through the water, and that it could not descend so rapidly as the common lead; but during repeated trials, in thirteen fathoms water, in which the rotator was frequently detached, and the lead suffered to descend alone, there was no difference perceptible in the time of their descent, though an excellent quarter-second stop watch was used during the experiment, to detect any change. The following table shows how very uniformly the times of descent corresponded with the depths in fathoms, during a series of trials made on the river Mersey, with the patent lead, weighing fourteen pounds.

The manner of conducting these experiments was such as is deserving of perfect reliance. Two pilots, of well known ability and experience, were employed: one threw the lead, and the other, the moment he found, by the slackening of the rope, that the weight had arrived at

the bottom, cried, 'stop,' to a third person who held the watch.

Time of descent.	Fathoms.	Time of descent.	Fathoms.
2 seconds	$2\frac{1}{2}$	$7\frac{1}{4}$ seconds	$11\frac{1}{2}$
$2\frac{1}{4}$ ———	3	$7\frac{1}{4}$ ———	$11\frac{1}{2}$
3 ———	4	$7\frac{1}{4}$ ———	$11\frac{1}{2}$
5 ———	8	$7\frac{1}{2}$ ———	12
$5\frac{1}{2}$ ———	$8\frac{1}{2}$	$7\frac{3}{4}$ ———	$12\frac{3}{4}$
6 ———	10	8 ———	13
6 ———	10	$8\frac{1}{4}$ ———	$13\frac{1}{2}$
7 ———	$11\frac{1}{4}$	6 ———	10

Taken when under sail, at upwards of five knots in the hour.

Several captains and masters in the navy have made trial of the log and sounding machine, and given very favourable reports of their performance. Of these the two following may be selected as specimens.

San Josef, 12th December, 1806.

Having several times, and in different depths and rates of sailing, tried Mr. Edward Massey's patent sounding machine, which is, in my opinion, a most excellent invention, as correct soundings were gained in fifty-five fathoms, with a strong breeze, going six knots, by only passing the lead to the quarter-boat, attaching a hand lead about thirty fathoms from the machine, (which I think, is in such cases necessary :) and about ninety fathoms of line out: at another trial, to compare the old with the new method, going five knots and a half, correct soundings were ascertained by the machine in fifty-two fathoms, by passing the line to the main-chains, when we could barely get the depth in the old way, by carrying the lead to the spritsail-yard, notwithstanding the im-

mense length of a first rate, and daylight in our favour; and not even then, if we had not had knowledge of the depth nearly, that being a check or caution not to give too much line off the reel, there being no time to gather in the slack, which would be the case were we sounding in an unknown place, by the old method. The invention is the more valuable, as the process is the most simple, the whole being understood, by seeing it once in use.

I therefore consider it a valuable improvement in navigation; as in frequent, and various cases, soundings could not be gained without it. The advantages are many, such as in chase, or being chased; on a lee-shore, or doubtful of it; and to save time in running for the desired port.*

R. J. NEVE, Captain.

N. B. It will be necessary in the practice of the new method of sounding, to have line of different sizes, in proportion to the depth of water; as by the ship passing at the rate of eight or ten knots, it will require the best of lines to haul in the lead, and should be made of a much superior quality to those at present supplied to the navy.

H. M. S. San Josef, in Torbay, 12th Dec. 1806.

SIR—In obedience to your orders, we have been particular in attending to the use of Mr. Edward Massey's Patent Log, and from every opportunity that offered during our cruize, we are strictly of opinion, that it has the merit of accomplishing the end for which it is intended.

* The honourable Navy Board have adopted the sounding machine for the use of his majesty's navy, and have favoured the inventor with an order for five hundred machines.

On some trials made with it, and the common log, they perfectly agreed, at other times they differed a little, but last night bearing up for Torbay, with a run of eighty miles in squally weather, there was a difference of nine miles: but agreeably to our reckoning the patent log was perfectly correct; we therefore consider it an important improvement in navigation, and the more so, as the instrument is simple and easy to be generally understood.

The chief things necessary to be observed are to secure the tow-line as near the surface as possible, to prevent the machine from quitting the water in an agitated sea, and fast sailing, and not to be less than sixty fathoms long in a first rate, to prevent it from being affected by the eddy of the ship's wake. We are, &c.

R. J. Neve, Captain.
Thomas Moore, Master.

To sir Charles Cotton, bart. viceadmiral of the red, &c.

No. 23.

On Preserving Seeds of Plants in a State fit for Vegetation. By John Sneyd, *Esquire, of Belmont, Staffordshire.**

Many years ago having observed some seeds which had got accidentally amongst raisins, and that they were such as are generally attended with difficulty to raise in England after coming in the *usual way* from abroad, I sowed them in pots, within a framing; and as all of them grew, I commissioned my sons, who were then abroad, to pack up all sorts of seeds they could procure in ab-

* Tilloch, vol. 3, p. 30. From the *Transactions of the Society for the Encouragement of Arts, &c.* vol. 16.

sorbent paper, and send some of them surrounded by raisins, and others by brown moist sugar; concluding that the former seeds had been preserved by a *peculiarly favourable state of moisture* thus afforded to them. It occurred, likewise, that as many of our common seeds, such as clover, charlock, &c. would lie dormant for ages within the earth, well preserved for vegetation whenever they might happen to be thrown to the surface, and exposed to the atmosphere, so these foreign seeds might be equally preserved, *for many months at least*, by the kindly covering and genial moisture that either raisins or sugar afforded them: and this conjecture was really fulfilled, as not one in twenty of them failed to vegetate; when those of *the same kinds*, that I ordered to be sent lapped in common parcels, and forwarded with them, would not grow at all. I observed, upon examining them all before they were committed to the earth, that there was a prevailing dryness in the latter, and that the former looked fresh and healthy, and were not in the least infested by insects, as was the case with the others. It has been tried repeatedly to convey seeds (of many plants difficult to raise) closed up in bottles, but without success; some greater proportion of air, as well as a proper state of moisture, perhaps, being necessary. I should also observe, for the satisfaction of the Society, that no difference was made in the package of the seeds, respecting their being kept in husks, pods, &c. so as to give those in *raisins* or *sugar any advantage over the others*, all being sent equally guarded by their natural teguments. Whether any experiments of this nature have been made by others, I am totally ignorant; but I think that, should this mode of conveyance be pursued still more satisfactorily than I have done, very considerable advantages might result from it.

No. 24.

A quick and easy Method of converting Weeds and other Vegetable Matter into Manure. By Mr. Brown, *of Derby.**

I BEG leave to communicate to the Society, and, if thought worth notice, by them to the world, a composition for manure. Fearful it would not answer the purpose so fully as I could wish, I deferred it from year to year; but I now find, both by numerous trials made by my friends, as well as myself, the very great utility of the composition, as well as its cheapness, with the capability of its being made in any situation and in any quantity. The mode of making it is as simple as, I trust, it will be found productive. It is nothing more than green vegetable matter, decomposed by quick or fresh-burnt lime. A layer of the vegetable matter about a foot thick, then a very thin layer of lime, beat small, and so on; first vegetable, then lime, alternately. After it has been put together a few hours, the decomposition will begin to take place; and unless prevented, either by a few sods, or a forkfull of the vegetables at hand, it will break out into a blaze, which must at all events be prevented. In about twenty-four hours the process will be complete, when you will have a quantity of ashes ready to lay on your land at any time you wish. Any and all sorts of vegetables, if used green, will answer the purpose; say weeds of every description. They will doubly serve the farmer, as they will not only be got at a small expense, but will in time render his farm more valuable, by being deprived of all noisome weeds.

* Tilloch, vol. 3, p. 32. From the *Transactions of the Society for the Encouragement of Arts, &c.* vol. 16.

But if this composition answers the purpose, as I flatter myself it will, a very short time will see almost every weed destroyed, which supposing to be the case, I have made my calculations with clover, grown for the purpose; for instance, I will take one acre of clover, which at one cutting will produce from fourteen to eighteen tons of green vegetable matter, and about three tons of lime: this, when decomposed by the above process, will yield ashes sufficient to manure four acres, the value of which I estimate at something under four pounds; the clover, according to the value of land here, I will say two pounds, which, take the average of the kingdom, is too much. The lime I will also say two pounds; but that will vary, according to the distance it is to be fetched. Take them together, I think will be about the average value. Now if this is the case, and as far as I have been able to try it I find so, how valuable must it be to the community in general! If it answers the purpose, I shall feel myself much obliged by the Society making it as public as they possibly can.

The vegetables should be used as soon after they are cut as possible, and lime as fresh from the kiln as the distance will allow of; as on those two circumstances depends the goodness of the composition.

No. 25.

Observations and Experiments on Staining Wood. By Professor Beckmann.*

THE oldest inlaid works now extant are preserved in Italy, and the most highly esteemed of these are those

* Tilloch, vol. 3, p. 54. From *New Transactions of the Royal Society of Gottingen*, vol. 6.

made by John of Verona, a monk and cotemporary of Raphael, who was born in 1470, and died in 1537. He was invited to Rome by pope Julius II, in order that he might add to the splendour and magnificence of the Vatican; and he left behind him many specimens of his art at Sienna, Naples, and other Italian cities. The works of this artist, on account of the variety and beauty of the stained pieces of wood employed in them, are still celebrated among connoisseurs, and preferred to all new works of the like kind. It is, however, to be lamented, that the processes used by John of Verona are at present altogether unknown, though the wood he employed was chiefly of European growth. Veneered or inlaid works are now so much in vogue, that there are few houses in which some of the furniture is not ornamented in this manner; and the sums of money expended every year for different kinds of foreign wood, necessary to supply this luxury, is very considerable. These woods are imported chiefly from India by the English, Dutch and French; and some of them are of more value than the best copper, the filings of which might be employed to make imitations of them. That narrow district alone on the Rhine between Darmstadt and Heidelberg receives annually for walnut tree wood the sum of ten thousand florins. Since mahogany furniture however began to be used, our cabinet makers have made scarcely any thing else than common works, because we are accustomed to purchase from the English, not only the materials, but also the works themselves; so that the time may come when no workmen of this kind will be found in Germany: on that account, it is well worth the trouble to make experiments on the staining of our own wood, in order to render them equal, if not to all foreign woods, at least to some of them, since many things can be coloured in that manner which are harder and more compact than wood. The

labours of Dufay in this respect are well known; and it appears by some papers of his among the Memoirs of the Academy of Sciences, that rock crystal, when exposed to the vapour of arsenic and antimony, assumes a red colour. Count de Borch's description of the method of staining marble in Italy may also be mentioned; and the process by means of the smoke of oak chips, which is employed by the Dutch for colouring their tiles and earthen ware. Canes are prepared for use in India, by dipping them in quicklime. That hard compact wood brought from America, and particularly Guiana, which, on account of its variegated and spotted appearance, is called *Bois de Lettres*, and which Aublet, who gives it the name of *Piratinera Guianensis*, much admired, has its whole surface stained by the Indians with the blackest and most durable colours.—As the art of staining wood seems at present to be nearly lost, the following experiments may be of some utility to artists:

1. *By Means of Oils and Acids.*

Experiment I.—A square piece of plane-tree wood, a line in thickness, was put into pounded dragon's blood from the Canaries* mixed with oil of turpentine, and placed over the fire in a glass vessel. The wood slowly assumed the colour, even before the spirit was volatilized. After more than an hour the vessel was taken from the fire and suffered to stand the whole night, when the wood appeared of a mahogany colour, not merely on the surface, but also in the interior parts. The denser fibres were somewhat less coloured, but this, instead of injuring the beauty of the wood, rather added to it. The red dye can be made stronger or weaker by taking a greater or less quantity of dragon's blood, and by a greater

* That from Madagascar is of an inferior quality.

or less degree of digestion and boiling. The wood of the plane-tree was chosen for this purpose, because it can be easily sawn and polished; because it has a white colour; is neither too hard nor too soft; because it neither contracts nor warps; has beautiful white spots with veins that cross each other; and because artists who make inlaid work have long attempted to colour it by staining. The wood, when stained, can very easily be freed from the dragon's blood adhering to it, by means of rectified spirit of wine. The spirit of turpentine makes the wood more compact, and renders it more susceptible of a fine polish.

II. Gamboge, dissolved in spirit of turpentine, gave to the whole surface of a small piece of wood a most beautiful shining golden yellow colour. The fibres and veins, on the other hand, had assumed a colour inclining a little to red. A piece of the wood of the pear tree assumed a darker colour, somewhat approaching to green, and which in part was nearly an olive colour. Different colours may therefore be obtained by employing different kinds of wood.

III. One part of dragon's blood, two parts of gamboge, with spirit of turpentine, gave to the wood of the plane tree or beech, according to the mixture of the colours and the nature of the wood, a remarkable variation of dyes. A bit of beech wood seemed always to assume a blackish yellow colour; and was thoroughly stained, when moderate heat was kept up for a sufficient length of time.

IV. Distilled verdigris (crystallized acetite of copper) could not easily be used in the above manner, as its colour is too much changed by oil and fire, as is known to those who employ it as a pigment. The olive colour also does not penetrate to the interior part of the wood.

2. *By Means of Spirit of Wine.*

EXPERIMENT I.—When dragon's blood and gamboge were merely dissolved in spirit of wine, the extract was not sufficiently strong, and the dye was of no use. The process, however, succeeds when the spirit of wine has been long boiled over a slow fire, till it is almost evaporated. The piece of wood appears then of a dark red colour, which is improved if the wood be washed in pure spirit of wine. But the colour is never so bright as that produced by means of an oil.

II. Gamboge with spirit of wine gave to wood in this manner a yellow, and gamboge and dragon's blood a yellowish red, colour.

3. *Experiment with Wax.*

WHITE wood boiled in spirit of wine, to which, when it began to boil, wax was added, could not be made to assume the green or the red dye, even in its small cross veins, which were exceedingly porous.

4. *Experiments with dissolved Salts and Metals.*

THE following experiments with these substances, which have already been described by Macquer, seemed to be most successful.

EXPERIMENT I.—A solution of common alum (sulphate of alumine) penetrates exceedingly well into wood which has been digested in it; so that hopes may be entertained of something being effected by it, as the white colour of every kind of wood becomes whiter by solutions of saline substances: this may be of great use to artists.

II. Wood soaked in a solution of gold assumed a red colour, but the inner part was only of a yellowish red.

III. Distilled verdigris dissolved in vinegar stained wood green, but the colour could never be brought to a grass green.

IV. Wood which has lain a long time under water becomes black, as experience shows, and looks as if charred. It, however, loses none of its toughness or compactness; and many trees dug up in Holland from the turf earth are employed there for ship-building. This effect of the sulphuric acid on wood gave occasion to the following experiment. Pieces of different kinds of wood, of considerable thickness, were placed in the sulphurous acid. In half an hour the whole surface of them was covered with a yellowish scurf, and the wood itself had the appearance of being charred. When washed in water, and exposed some hours to the open air, it was observed that the black colour had penetrated still farther, that the interior part only retained the natural colour, and that the wood was exceedingly close and compact. After this wood had been several times rubbed over with the oil or spirit of turpentine, it became harder and firmer, so that it could receive the highest polish; by which means the colour was rendered more agreeable. This process may be readily employed by artists, as it is easy, and does not require much expense.

V. Another black dye for staining wood, which succeeds extremely well, and may lead to other useful experiments, is that formed with liver of sulphur (sulphuret of potash) and metallic solutions. As the sulphurized hydrogen gas is so subtle that it penetrates the closest bodies, it might readily be conjectured that it would easily give a black colour to wood, if the latter could any how be made to imbibe it with a metallic solution. Pieces of different kinds of wood were placed, for several days successively, in a solution of acetite of lead, and a solution of silver, copper, iron, and other metals; after which a

solution of arsenical liver of sulphur was prepared in the following manner: One part of the arsenical liver of sulphur was mixed with two parts of clear quicklime, in a porcelain vessel, over which was poured six or eight parts of boiling water. The solution was then poured off, and the wood which had been impregnated with the above metallic solutions being placed in it and suffered to remain several days, the vessel being closely shut, it assumed a black colour. The solution of acetite of lead produced the greatest effect; that of silver next, and those of the other metals least of all. Spotted wood, and particularly that of the plane, beech, and pear tree, assumed the best colour. It is therefore beyond all doubt that porous wood, such as that of the lime, the elder, &c. could be stained much easier. Though the arsenical liver of sulphur from lime may appear superfluous, as the common, which is prepared from alkaline salts and sulphur, can produce the same effect, the above process however is that which ought to be recommended. This method of staining may be considered as the best, because it impregnates the wood with metallic particles, gives it a hardness susceptible of a fine polish, and secures it from worms. The vessel employed for this purpose must be either of porcelain, stone ware, or glass.

No. 26.

Experiments made to ascertain the Composition of the Swedish Stone Paper or Artificial Slate. By J. G. Georgi.*

THE invention of Arfuid Faxe, confirmed by many experiments tried at Carlscrona, but not yet communica-

* Tilloch, vol. 3, p. 158. From the *New Transactions of the Imperial Academy at Petersburgh*, vol. 4.

ted to the public, for making a certain kind of artificial slate or stone paper, which may be procured at a small expense, and can be employed instead of common slate, was announced and highly extolled a few years ago in several of the public journals. This substance was said to have a great resemblance to milled or paste-board; to be of an iron-red, white, or yellow colour; to be very hard and stiff, but somewhat elastic; to be subject to no alteration even when immersed in cold water for several months, or when boiled for several hours; to be hardened by exposure to the air; to resist fire a long time, and to burn slowly, after having experienced a great degree of heat, but, when left to itself, to become soon extinguished.

It is evident, therefore, that this paper may be applied to various economical purposes, such as sheathing ships, which it would not only preserve from rottenness, but also from being destroyed by worms; for guarding from fire the cooking places in ships and powder magazines, and, lastly, for covering houses and wooden buildings. To this it may be added, that plates of this paper fixed on with brass nails, and done over at the joinings with cement, might be covered with some oil varnish in such a manner as to be altogether impenetrable to moisture. We are told also that a small building constructed of wood at Carlscrona, and cased over with stone paper, after being filled with combustibles and set on fire, resisted the effects of the flames and remained unhurt, and that the same experiment repeated at Berlin on a smaller building was attended with the same result. One great advantage of this stone paper also is, that it is exceedingly light, and may in general be procured at a cheaper rate than any other materials for covering roofs, as a plate of it twenty-three inches in length and fourteen inches

in breadth costs at Carlscrona only two schellings Swedish.

An invention of such utility and importance ought therefore to excite the ingenious to attempt an imitation of it, in order that, if possible, it may be rendered more public. As soon as I obtained a specimen of it from Sweden, I made experiments to try whether I could not discover the method of making it. The fragment which I first examined was a line in thickness. It was light, easily broken, and possessed all the properties above enumerated. As the analysis by which M. Antic de Servin, at the request of M. Crell, endeavoured to illustrate the nature of this paper, did not appear to me satisfactory, I subjected part of the specimen sent me to a farther examination, leaving a third portion entire for the sake of comparison.

After this examination the red stone-paper appeared to me to consist of, 1. Martial bole, which seemed to be equal to half its weight, and which, on account of the chalk perhaps, or calcareous earth with which it was mixed, produced a little effervescence with acids. Perhaps also there were some particles of another earth, the discovery of which would be of little importance to the object of this research. 2. A vegetable matter of little weight, and similar to that used in the making of common paper. This formed about a fourth part of the weight. 3. An animal glue, similar to that which is procured by boiling from various animal substances: and, 4. A certain oil which seemed to have a resemblance to linseed oil. These substances (3 and 4) made about a fourth part of the weight.

Another specimen which I received from Mr. Cameron, architect to her imperial majesty, contained the same substances in proportions a little different. I was, however, not able to obtain specimens of the white and yel-

low stone-paper, in which M. Servin observed some traces of martial vitriol (sulphat of iron).

Though I made a number of experiments in order to discover the composition of this slate, I shall here mention those only which were attended with the best success. But, to avoid repetition, I shall first describe that previous manipulation which appeared most convenient.

The red or white bole, carpenters' ochre and chalk, which I employed for this use, were reduced to a fine powder. A pulpy mass of the coarsest kind, procured from a paper manufactory, after being macerated in water, was strongly pressed and weighed out for use. The weight was increased about two thirds by the moisture. In giving an account of the following experiments, I shall mention the weight of this substance as alluding to it when dry.

The glue was dissolved in a moderate quantity of water. I added martial vitriol undissolved, and employed unboiled linseed oil.

For want of a sufficient quantity of raw pulp, I procured, for some experiments, fragments of coarse old paper and bookbinders' shavings, which, after being boiled for about three hours, were much tenderer than that brought from the paper manufactory. A pound of this when wet, after it had been pressed, exceeded that which was dry by about two thirds.

The pulp procured from a paper manufactory being mixed in a mortar with the dissolved gluten, and being afterwards formed into a paste by the addition of the above earths and sulphat of iron, was well beat up in the mortar, and linseed oil then poured over it. The mass, being prepared in this manner, was spread out with a spatula above a sheet of coarse paper placed on a board furnished with a rim or border; another sheet of the same

paper was then spread over it, and a second board was placed above all. The whole being then inverted, the board with the rim was taken off, and then the first sheet of paper. The compressed mass was then laid over upon another board sprinkled with sand, and left to dry, after taking the sheet of paper from its other side. Squares made in this manner dry without cracking; but as they become warped, it is necessary afterwards to flatten them, by putting them, with boards between, under a screw-press, and letting them stand for some time.

Experiment I. I mixed an ounce and a half of the dry pulp from the mill with two ounces of common glue, and, having added red bole and ochre, of each two ounces, obtained a smooth plate.

II. To two ounces of pulp I added four ounces of red bole pulverized, and half an ounce of chalk, with an ounce and a half of glue. The plate thus produced was full of wrinkles and chinks, but tolerably hard.

III. An ounce and a half of pulp, with four ounces of bole, and two of sulphat of iron, produced a plate equally hard, but uneven.

IV. An ounce of pulp procured from old paper and bookbinders' shavings mixed, with half an ounce of glue, an ounce of powdered chalk, two of bole, and an ounce of linseed oil, produced two thin plates smooth and hard.

V. Two ounces of pulp from the mill, with half an ounce of glue, six ounces of red bole and two of chalk, to which were added two ounces of sulphat of iron, and the same quantity of linseed oil, afforded plates that were smooth, but not strong.

VI. An ounce and a half of pulp, with an ounce of glue, and four ounces of white bole, produced a plate smooth, beautiful, and hard.

VII. An ounce and a half of pulp, mixed with two ounces of glue, two ounces of white bole, and as much chalk, yielded a smooth plate as hard as bone.

VIII. An ounce of pulp, one ounce of glue, three ounces of white bole, and an ounce of linseed oil, produced a plate sufficiently perfect and elastic.

IX. A plate which I formed of an ounce of pulp, with half an ounce of glue, three ounces of white bole, an ounce of chalk, and an ounce and a half of linseed oil, was superior to that mentioned in the preceding experiment. This substance retains figures impressed upon it, and, tinged with half a dram of Prussian blue, assumed a blueish-green colour.

X. An ounce and a half of pulp, with an ounce of glue and four ounces of chalk, afforded a plate exceedingly spongy.

XI. An ounce and a half of the same pulp, one ounce of sulphat of iron, and four ounces of white bole, without glue, produced a plate yellowish and spongy.

XII. An ounce and a half of pulp, four ounces of white bole, with an ounce of sulphat of iron, and the same quantity of glue, produced a yellowish plate a little more solid.

I tried several other mixtures; but as the plates they produced were of an inferior quality, I shall not give any account of them. The plates which had been prepared in the above manner I cut into several pieces, and daubed over a specimen of each with boiled linseed oil. The parts covered with the oil assumed a darker colour, and the superficies acquired more solidity, nor were they less capable of resisting fire.

Being desirous of comparing the productions of my experiments with specimens of the Swedish stone paper, I macerated about an inch square of each in cold water. After they had been macerated four months, the speci-

mens prepared with sulphat of iron were considerably swelled, but those made without linseed oil seemed to have scarcely swelled at all. Those, however, which I had daubed over with boiled linseed oil, or linseed oil varnish, exhibited as little appearance of change as the Swedish.

I put a square inch of each of the different kinds upon an iron spatula, together with a like quantity of beech wood, and exposed the whole to a strong heat in the mouth of a furnace. After fifteen minutes the wood began to burn, and in fifteen minutes more was reduced to ashes. The fragments of the different specimens of the stone paper, exposed to the same heat, were in such a state of ignition that they hissed when immersed in water. I, however, examined them with great attention. The fragment of the Swedish manufacture was somewhat black on the surface, and puffed up into small blisters; but did not seem to have burnt, or to have changed its form. The specimens prepared with the sulphat, being more spongy at the edges, burnt; but so slowly, that in those of the worst quality the fourth part was scarcely consumed in the above time. All the rest, inferior in nothing to the Swedish specimen, resisted the fire with equal strength; so that most of them were only a little blackish on the surface, and entirely free from blisters; nor did there appear any difference that could be ascribed to the glue or linseed oil employed, as they were all of the same consistence, and none of them seemed to have been warped by the heat.

I then put some of the same fragments toasted in the fire on a red hot plate of iron, and immediately exposed them for fifteen minutes to a strong heat in the middle of a furnace. The Swedish specimen burnt, and for five minutes emitted a thick smoke; then appeared of a white heat for some time, and at the end of fifteen minutes was

converted into three friable cineritious laminæ. The specimen produced by my first experiment burnt in the course of a minute, kept up a flame for three minutes, and in fifteen minutes was converted into a black plate sufficiently hard. Specimens of the second, third, and fourth experiments exhibited the same appearances. A plate produced by the fifth experiment was sooner destroyed by the fire, and appeared friable like the Swedish. A plate of the sixth experiment, which before had been scarcely changed by the fire, bore the last exposure exceedingly well; was scarcely changed in its form and magnitude, continued sufficiently hard, and was only rendered black and as it were scorched. A specimen of the seventh experiment burnt for a whole minute, and became black and friable like the preceding. A specimen of the eighth burnt for two minutes, and then continued black and sufficiently hard. The same was the case almost with the ninth specimen. A specimen of the tenth, though it became black, was however scarcely changed. A fragment of the eleventh experiment burnt with a flame for about two minutes and was converted into ashes; which was the case also with the specimen produced by the twelfth experiment.

Those specimens produced by my fourth, sixth, seventh, eighth, and ninth experiments, seemed to be the best in their external qualities and their power of withstanding fire and water. The same fragments suffered as little from the influence of the weather and atmosphere as the Swedish. The materials for making this article may be readily procured for a small price; and the process is simple, and requires very little time. My specimens indeed were not so neat and elegant as the Swedish; but this inferiority may be obviated by practice and experience; and even in its imperfect state the invention may be of great economical utility.

The cement which the Swedes recommend for filling up the interstices between the squares, and of which I received a specimen of Mr. Cameron, was composed of linseed oil varnish, white lead and chalk, mixed together in such a manner as to approach to a fluid state, that it might more easily insinuate itself into the fissures.

As the chief use of this invention is to cover and incrust houses, I was desirous of trying my production by exposing it to the effects of the weather. I therefore nailed fragments of the Swedish stone paper, and of that made by myself, to a small board; and having daubed over the joinings with cement, I exposed them in the month of August on the top of my house, and in the beginning of April the next year I found they had undergone no change.

No. 27.

Observations on the Manufacture of the Acetite of Copper or Verdigrise, Verdet, &c. By J. A. Chaptal.*

THE acetite of copper is one of the preparations of that metal most frequently used in the arts. It is not only one of the principal resources of painting, but upon many occasions is employed with great advantage in dyeing. Almost all the oxydes of copper obtained by the action of saline substances have a blue colour, more or less inclining to green, and almost all the neutral salts corrode the metal, and produce that oxyde which is called verdigrise. It is sufficient to bring them into contact with the copper, or to immerse the metallic plates in a

* Tilloch, vol. 4, p. 71. From *Annales de Chimie*, no. 75.

saline solution, and afterwards to expose them to the air to dry.

Those acids which oxydate the copper by their decomposition, produce an effect like that of neutral salts. The oxyde is of a soft blueish-green colour; their action is so speedy, that if the copper be exposed to the vapour of them for some minutes, its surface will be immediately oxydated. The oxygenated muriatic acid produces that effect as well as the vapour of the nitric acid, and even those of the sulphuric acid. A phenomenon which cannot escape the eye of an observer is, that the oxydes of copper obtained by fire are very different from those produced by the decomposition of acids on that metal. The colour of them is grey, instead of being green; and when the calcination is continued a long time at a violent heat, they may be concentrated to a red oxyde of a blood colour. This phenomenon was observed by Kunckel in his chemical laboratory.

Saline substances are not the only ones capable of oxydating copper green. All oils and fat matters produce the same effect. Even water, when left for a considerable time in copper vessels, causes an oxydation. But what will appear very extraordinary is, that the greater part of these substances have no sensible effect upon copper, except when cold. Those salts even which corrode that metal when left at rest in vessels, do not attack it in so sensible a manner when in a state of ebullition.

Of all the preparations of copper by oxydation, there is none more valuable than that made by vinegar. All the verdigrise used in commerce is prepared by that acid, and it is at Montpellier in particular and in the neighbourhood, that the manufactories of it are established. In the Memoirs of the Academy of Paris for 1750 and 1753, may be seen a very exact description of the pro-

cess then followed at Montpellier for making verdigrise; but as that process has been much improved, and as at present the husks of grapes are employed instead of the stalks, a method far more economical, since wine is no longer used, the following account of the manner of manufacturing verdigrise, as now practised, may be of utility to the public.

The first materials used for this purpose are copper and the husks or skins of grapes left after the last pressing. The copper employed was formerly all imported from Sweden; but at present it is brought from different foundries established at Saint Bel, Lyons, Avignon, Bedarieux, Montpellier, &c. It is in round plates half a line in thickness, and from twenty to twenty-five inches in diameter. Each plate at Montpellier is divided into twenty-five laminæ, forming almost all oblong squares of from four to six inches in length, three in breadth, and weighing about four ounces. They are beat separately with the hammer on an anvil to smooth their surfaces, and to give the copper the necessary consistence. Without this precaution it would exfoliate, and it would be more difficult to scrape the surface in order to detach the oxydated crust. Besides this, scales of pure metal would be taken off, which would hasten the consumption of the copper.

The husks of grapes, known at Montpellier under the name of *racque*, were formerly thrown on the dunghill after the poultry had picked out the small stones contained in them. At present they are preserved for making verdigrise, and sold at the rate of from fifteen to twenty livres per *muid*. The preparation of them is as follows: After the vintage is finished, the husks are subjected to the press, in order to extract all the wine with which they may be impregnated, and they are then put into vats, where they are pressed down with the feet to

fill up all the vacuities and render the mass as compact as possible. The coverings of these vats are carefully fastened down, and they are preserved for use in a dry cool place.

These husks are not always of the same quality: when the grapes contain little of the saccharine matter, when the season has been rainy, the fermentation incomplete, or when the wine is not generous, the husks are attended with several faults. 1. They are difficult to be preserved, and there is great danger of their soon being spoiled. 2. They produce very little effect, cannot be easily heated, send forth very little of the acetous odour, and make the plates of copper sweat without showing efflorescence on their surface. Independently of the nature of the grapes and the state of the wine, the quality of the husks varies also according as they have been expressed with more or less care. Husks which have not been much pressed, produce a far greater effect than those which have been dried. To explain their different effects, it will be sufficient to observe that their action is proportioned to the quantity of wine they retain, as it is that liquor alone which can pass to the state of vinegar. When the husks therefore are destined for a verdigrise manufactory, care must be taken to express them only weakly, in order to preserve more of their acidifiable principle.

When a sufficient quantity of copper and of husks has been provided, nothing remains but to proceed to the operations, which are generally performed in cellars. They may be performed also on a ground floor if it be somewhat damp, if the temperature be subject to little variation, and if there be not too much light. The first operation is to make the husks ferment, which is called *avina*. For that purpose one of the vats is opened, and the husks are put into two others of equal size, taking

care to expose them as little as possible to the air, and not to compress them. One vat full of husks ought to fill two, and to occupy a double space after this operation. In some manufactories the husks contained in a vat are distributed into twenty or twenty-five earthen vessels or jars called *oules*, and which are generally sixteen inches in height, fourteen in diameter at the belly, and about twelve at the mouth. When the husks have been put into these vessels, they are covered by putting the lid merely on the opening without pressing it down. The covers are of straw, and made for that purpose. In this state the husks soon heat; and this change may be known by thrusting the hand into them, and by the sour smell which they begin to exhale. The fermentation first takes place at the bottom of the vessel, and gradually ascending extends itself to the whole mass. It proceeds to 30 or 35 degrees of Reaumur.

At the end of three or four days the heat decreases, and at length ceases entirely; and as the manufacturers apprehend the loss of a portion of the vinegar by the natural effect of a heat too much prolonged, they take care after three days fermentation to remove the husks from the fermenting vessels, in order that they may sooner cool. Those who employ vats remove them into jars, and those who use jars put them into others. Besides the loss of the acetous spirit, too great heat inclines the mass at the bottom of the vessel to become mouldy, which renders it unfit for making verdigrise. Some manufacturers, to increase the effect of the husks, form them into heaps, which they besprinkle with generous wine before they bring them to ferment.

The fermentation does not always take place at the same time, nor with the same energy. Sometimes it commences in twenty-four hours, and sometimes it has not begun at the end of three weeks. The heat some-

times will rise to such a height that the hand cannot be kept in the mass, and the acetous odour is so strong that one can hardly approach the vessels; while at others the heat is hardly sensible, and soon vanishes. There are even instances of the husks becoming putrid and mouldy without turning acid. The fermentation is assisted and promoted by raising the heat of the place by means of chafing-dishes, by covering the vessels with cloths, by shutting the doors, and by airing the mass with more care. The differences in the fermentation depend, 1. On the temperature of the air: in summer the fermentation is speedier. 2. On the nature of the husks: those which arise from very saccharine grapes heat more easily. 3. On the volume of the mass: a larger mass ferments sooner, and with more strength, than a small one. 4. On the contact of the air: the best aired husks ferment best.

At the same time that the husks are made to ferment, a preliminary preparation called *desafouga* is given to the plates of copper which are used for the first time. This operation is not employed for those which have been already used, and consists in dissolving verdigrise in water in an earthen vessel, and rubbing over each plate with a piece of coarse linen dipped in this solution. The plates are then immediately placed close to each other, and left in that manner to dry. Sometimes the plates are only laid on the top of the fermented husks, or placed under those which have been already used for causing the copper to oxydate. It has been observed, that when the operation called *desafouga* has not been employed, the plates grow black at the first operation, instead of becoming green.

When the plates are thus prepared, and the husks have been brought to ferment, the workmen try whether the latter are proper for the process, by placing under

them a plate of copper, and leaving it buried there for twenty-four hours. If the plate of copper, after this period, is found covered with a smooth green crust, in such a manner that none of the metal appears, they are then thought fit for being disposed in layers with the copper. On the other hand, if drops of water are observed on the surface of the plates, the plates are said to *sweat*, and it is concluded that the heat of the husks has not sufficiently subsided. They consequently defer making another trial till the next day. When they are assured that the husks are in a proper state, they form them into layers in the following manner:

The plates are all put into a box, which, instead of having a bottom, is divided in the middle by a wooden grate. The plates disposed on this grate are so strongly heated by a chafing dish placed under them, that the woman employed in this labour is sometimes obliged to take them up with a cloth, in order that she may not burn her hands. As soon as they have acquired that heat, they are put into the jars in layers with the husks. Each jar is then closed with a covering of straw, and left to oxydate. This period is called *coüa*, to hatch. Thirty or forty pounds of copper, more or less according to the thickness of the plates, are put into each jar. At the end of ten, twelve, fifteen, or twenty days, the jar is opened; and if the husks are white, it is time to take out the plates. The crystals are then seen detached, and of a silky appearance on their surface. The husks are thrown back, and the plates are put in what is called *relai*. For that purpose they are immediately deposited in a corner of the cellar on sticks ranged on the floor. They are placed in an upright position, one leaning against the other; and at the end of two or three days they are moistened, by taking them up in handfulls and immersing them in water in earthen pans. They are deposited quite wet in their for-

mer position, and left there for seven or eight days; after which they are once or twice immersed again. This immersion and drying are renewed six or eight times, every seven or eight days. As the plates formerly were put into wine, these immersions were called *one wine, two wines, three wines,* according to the number of times. By this process the plates swell up, the green is nourished, and a coat of verdigrise is formed on all their surfaces, which may be easily detached by scraping them with a knife.

Each jar furnishes five or six pounds of verdigrise at each operation. It is then called fresh verdigrise, moist verdigrise, &c. This verdigrise is sold in that state by the manufacturers to people who dry it for foreign exportation. In this first state it is only a paste, which is carefully pounded in large wooden troughs, and then put into bags of white leather, a foot in height and ten inches in diameter. These bags are exposed to the air or the sun, and are left in that state till the verdigrise has acquired the proper degree of dryness. By this operation it decreases about fifty per cent, more or less according to its primitive state. It is said to stand proof by the knife, when the point of that instrument pushed against a cake of verdigrise through the skin cannot penetrate it.

The plates of copper which have been already used are again employed for the same operation, till they are almost completely consumed. Instead of heating them artificially, as above mentioned, they are sometimes exposed only to the sun. The same plates will serve sometimes for ten years, but they are often worn out in two or three. This, however, depends on the quality of the copper. That which is extremely smooth, well beat, and very compact, is always most esteemed.

Formerly moist verdigrise could not be sold till its quality had been previously ascertained; and for that purpose it was carried to a public warehouse, where it was sold after that point had been determined.

By comparing this process with that described by Montet, it will be found that the changes introduced are much in favour of the new. Formerly the workmen took the stalks of the grapes dried in the sun, and began by immersing them for eight days in *vinasse* (the residuum of the distillation of wine for making brandy). They then suffered the moisture to drain off through a basket, after which they put about four pounds into a jar, and poured over them three or four pints of wine. The stalks were made to imbibe a large portion of the wine, by stirring them strongly with the hand; the jar was then covered, and the stalks were suffered to ferment. The fermentation commenced sooner or later, according to the nature of the wine and the temperature of the air. But after it had once begun, the wine became turbid, and exhaled a strong odour of vinegar. At length the heat decreased, and the stalks were then taken out, and the wine was drawn off. When the stalks were a little drained, they were disposed in layers with the plates of copper, and the operation was continued in the same manner as with the husks. When the plates were taken from the jars to be put in *relai*, instead of immersing them in pure water, as is done at present, they were moistened three or four times with sour wine, which was called giving them three or four wines.

It may be easily seen that there is a great saving in the process followed at present, since the manufacturers no longer use wine, which enhanced the price of the verdigrise. Some have condemned, in the new process, the practice of using the copper too soon; but this objection fell to the ground, when it was observed that the verdi-

grise obtained was in proportion to the copper corroded; and what proves that this method is more advantageous, is, that all the manufacturers have abandoned the old method and adopted the new.*

No. 28.

On the Method of preparing Tallow Candles with Wooden Wicks. By Professor Medicus *of Heidelberg.*†

"FOR several years past tallow candles with wooden wicks have been prepared, in large quantities, by the candlemakers at Munich, and much used in that neighbourhood. I have burnt them during the whole winter, and never wish to use any other kind, as they are attended with several advantages which common tallow candles do not possess. They afford about the same quantity of light as a wax candle; burn also with great steadiness and uniformity, and never crackle or run. The candlemakers here keep the method of preparing these candles as secret as they can; but I shall communicate to the public what I have been able to learn respecting the process.

"The only difference between these candles and the common tallow candles is, that the ground work of the wick consists of a very thin slip of wood, bound round to a considerable thickness with very fine unspun cotton; but in such a manner that the size of the wick does not much exceed that of the wick of a common candle. The

* There are no large manufactories of verdigrise at Montpellier; but each family makes a certain quantity, and the operations are in general performed by women.

† Tilloch, vol. 4, p. 79. From Riems *Neue Sammlung Oekonomischer Schriften*, part 12.

cotton is wound round the wick by the hand; but in general it is done by means of a reel, which I have not yet been able to see. The thin slips of wood are furnished to the candlemakers by the country people, and, if we may judge from their appearance, are cut into the proper form by means of a knife, without the application of any machine. They are for the most part somewhat square, and not completely rounded. The candlemakers often prepare these slips of wood also themselves, when they have none ready by them, and for that purpose use pine, willow, and other kinds of wood, though they commonly employ fir. For making these candles it is necessary to have the purest tallow: a pound will be sufficient to make six or seven, which cost twenty-five kreutzers. The price of common moulded candles with cotton wicks is twenty-two kreutzers; but as the former burn much longer, they are on the whole cheaper."

Another method of making the wicks is as follows: Take shoots of the pine tree a year old, scrape off the bark, and when they are become perfectly dry scrape them again all round till they are reduced to the size of a small straw. When the above wood cannot be procured, well dried common fir twigs of a year old, and of the same strength, may be prepared in the like manner. These rods are then to be rubbed over with wax or tallow, till they are covered with a thin coating of either of these substances; after which they must be rolled on a smooth table in very fine carded cotton, drawn out to about the length of the rod or candle-mould. Care however must be taken that by this rolling no inequalities may arise on the rod, and that the cotton may be every where of equal thickness, though at the upper part a little more of it may be applied. After this preparation the wick will have acquired the size of the barrel of a small quill; and the more accurately the size of the wick is

proportioned to that of the candle mould, the candles will burn so much the better, clearer, and longer, as will soon be found by a little experience: these wicks are then to be placed very exactly in the middle of the mould, and retained in that position, and good tallow, fresh if possible, previously melted with a little water, must be poured round them; but even old and rancid tallow will not run, if the wicks be properly made.

These candles, besides burning longer than the common ones, have also this advantage, that they do not flare, and that they are less prejudicial to the eyes of those who are accustomed to read or write at night. It is, however, to be observed, that a pair of sharp scissors must be employed for snuffing them, and that in performing that operation care must be taken not to break or derange the wick.

No. 29.

Account of the Method of making Stilton Cheese. By Mr. John Monk, *of Bears-combe, Devon.**

STILTON cheese is made in most of the villages round Melton Mowbray, but I found it impossible to get at the secret of making it from the dairy people; and, from the conversation I had with one of the first managers, I should suppose two cheeses were never made alike, as it depends upon soil, herbage, seasons, heat, cold, wet, dry, &c. &c. There is no doubt but those cheeses require a great deal of care and attention, owing, I should suppose, to their richness and thickness. They run from eight to sixteen or eighteen pounds, very sel-

* Repertory, vol. 1, p. 175. From the *General View of the Agriculture of the County of Leicester;* drawn up for the consideration of the Board of Agriculture.

dom larger, and are sold at one shilling per pound. Most of the inns in the county retail them, the price thirteen and fourteen pence per pound. I was informed by the maker, that they were never better for the table than at a year old, but I believe they are seldom cut so soon. The *best* of the other sort of cheese made in the county is, in my opinion, better than the generality of the Stilton, as it is but seldom you meet with a real good one.

In respect to the grand secret of making Stilton cheese, I should have left the county without acquiring the process, if it had not been for the politeness and attention of major Cheselden, of Somerly, who, upon my acquainting him with my disappointment, kindly undertook to procure it for me from one of his tenants, who was among the first for making it. The following is the receipt.

Take the night's cream, and put it to the morning's new milk, with the rennet; when the curd is come, it is not to be broken, as is done with other cheeses, but take it out with a soil-dish altogether, and place it in a sieve to drain gradually, and, as it drains, keep gradually pressing it till it becomes firm and dry; then place it in a wooden hoop; afterwards to be kept dry on boards, turned frequently, with cloth binders round it, which are to be tightened as occasion requires.

N. B. The dairy-maid must not be disheartened, if she does not succeed perfectly in her first attempt.

In the dairies which I visited, the cheeses, after being taken out of the wooden hoop, were bound tight round with a cloth, which cloth was changed every day, until the cheese became firm enough to support itself; after the cloth was taken off, they were rubbed every day all over, for two or three months, with a brush; and if the weather was damp or moist, twice a day; and, even before the cloth was taken off, the top and bottom were well rubbed every day.

No. 30.

List of American Patents.

(Continued from vol. 1, page 480.)

1805.

Increase Kimball, May 1, machine for cutting nails, brads, &c.

Joseph Copes, May 2, improvement in the grist mill.

Horatio G. Spafford, May 3, a close fire place.

F. Lippart, May 3, machine for raising water from a running stream.

John Stickney, May 4, improvement in andirons.

Robert Crane, junior, May 4, iron wheel for transporting carriages.

Samuel Church, May 4, a felloe mill.

John Houston, May 4, a metallic hone.

Simeon Glover, May 4, a cross cramp for four-wheeled carriages.

Abraham Higham, May 4, a washing and scouring machine.

Daniel Atherton, May 4, improvement in the physiognotrace.

Joseph Platt, May 4, machine for raising and removing earth.

Allen Hill, May 6, a beaming machine.

Jacob Welsh, May 6, machine for removing earth, &c.

John Kunitz, May 7, bleeding with and breeding leaches.

Isaac Baker, May 8, machine for sawing shingles.

W. Smith, May 9, improvement in glazing and polishing linens, &c.

George Poyzer, May 10, improvement in making cod oil for leather.

M. Zorger, May 10, machine for shelling and hulling clover seed.

Ebenezer Lester, May 10, making moulds for casting iron screws.

Barn. Langdon, May 10, improvement in manufacturing tin ware.

James Humiston, junior, May 10, improvement in the sluice to convey water to horizontal wheels, and in the manner of forming the wheels of cast iron, &c.

H. Witner, May 17, improvement on Anderson's condensing tub.

Thomas W. Pryor, May 21, improvement in the bark mill.

William Hodgson, May 22, apparatus for making tiles, bricks, &c.

Thomas Pierce, May 24, improvement in the smut fanning mill.

William Cooley, May 27, mode of making posts of clay for fencing.

Daniel Tomlinson, May 27, machine for raising or projecting fluids.

Benjamin Eggleston, junior, May 27, method of boiling, applicable to distilling, brewing, &c.

Ebenezer Jenks, June 1, improvement in the mode of setting boilers of every description.

John Bennock, June 1, improvement in planing by machinery.

J. Hinman, June 1, planing machine for sawing bellows boards, &c.

Alexander M'Nitt, June 15, method of separating, preparing, and collecting the sulphate of pot-ashes into sal polychrestum, &c.

Lewis Valcourt, June 25, improvement in mills and machinery.

J. Macbride, Aug. 8, machine for ginning, carding and spinning cotton.

J. Matthews, Aug. 13, machine for grinding, sawing, or rasping dye woods.

William Wing, Aug. 28, machine for casting types.

William Wing and Henry Salisbury, Aug. 29, improvement in springs for wheel carriages.

Ch. M'Lean and Sol. Loomis, Sept. 25, improvement in tub mills.

Samuel Bartlett, Oct. 1, a clay pipe for conduits.

Asahel A. Kelsey, Oct. 9, improvement in making shingles.

Daniel French, Oct. 9, manufacturing old junk or old rigging into oakum.

Joseph Share, Oct. 28, improvement in casting ship bolts.

William Deane, Nov. 4, improvement in rafts.

La Paype (ainé) Nov. 4, improvement in cattle mills.

Seraphim Bellij, Nov. 7, machine for raising water.

William Lillie, Nov. 9, machine for splitting skins.

John Gilman Taylor, Nov. 13, improvement in making salt.

Friend B. Kellogg, Nov. 22, machine for shearing woollen or other cloth by water, &c.

Abraham Heistand, Nov. 27, a distilling apparatus.

James Tatterson, Dec. 7. machine for preparing and hackling tow for paper or linen.

William Johnson Fulsom and John Hayden, Dec. 17, machine for washing, rinsing, and wringing clothes.

George Barber Dexter, Dec. 18, rheumatic pill.

William Poole, Dec. 20, a kiln for drying grain.

James Abraham, Dec. 20. improvement in kilns for drying grain.

Samuel Adams, Dec. 28, machine for reaping grain.

1806.

Ebenezer Bryant, Jan. 13, a rowing machine.

Sam. Goodwin and Rich. Gains, Jan. 22, a balance pendulum lock.

R. Gookins, Jan. 24, machine for making bats or frames for wool hats.

C. Thompson, Feb. 5, machine for copying charts, landscapes, &c.

Philip Bennet, Feb. 8, a loom for weaving chip.

William Finn, Feb. 13, a spring pump for raising water.

Michael Morrison, Feb. 14, machine for picking oakum.
George Richards, Feb. 14, machine for making dough.
Theodore Burr, Feb. 14, improvement in bridges.
Joseph Hawkins, Feb. 19, a planing machine.
Samuel Hawkins, Feb. 19, improvement in gun carriages.
John Eveleth, Feb. 21, machine for raising mud.
Israel Newton, Feb. 28, medicine called the essence of tansy.
John F. Gould, March 1, machine for making bricks.
Richard Howel, March 5, improvement in suspenders.
Thomas Arnold, March 5, improvement in evaporation.
Samuel Dickey, March 7, improvement in stoves.
John F. Gould, March 8, improvement in tilt hammers.
Joseph S. Mott, March 8, a joining and planing machine.
Richard Gaines, March 17, a balance pendulum lock.
William Purden, March 19, a hoisting machine.
George Youle, March 21, improvement in a cabouse.
Elisha Mack, March 21, machine for dressing flax.
Daniel Pettibone, March 22, preparing and welding cast steel to iron or other steel for tools.
John Kennion, March 26, a fulling mill and washing machine.
Abner Guild, March 31, carding machine to form batts for wool hats.
S. Payn, March 31, machine for splitting skins or neats' leather.
Richard Tripe, April 1, improvement in diving machines.
Isaac Quintard, April 5, improvement in cyder and bark mills.
John Heavin, April 17, improvement in propelling boats.
Do. Do. machine for cutting straw.
Joseph Quinby, April 25, improvement in saw mills.
Ephraim Hubbel, May 1, improvement in water wheels for mills.
C. Varlé, May 2, method of reducing calcareous matters into lime.
John Edwards, May 19, improvement in the steelyard.
John Edwards, May 19, improvement in scale beams and balances.
George Youle, May 21, a cabouse stove, apparatus for cooking and distilling, &c.
John Cooper, May 22, improvement in windmills.
James Gridley, May 23, improvement in boxes for carriage wheels.
Beriah Swift, May 25, machine for shearing cloth.
Abner Wing, May 26, improvement in the churn.
Reuben Buck, May 29, a washing machine.
Levi Brown, May 30, improvement in boxes for carriage wheels.
Standfast Smith, June 12, method of extracting salt from sea water.

Standfast Smith, June 13, improvement facilitating the process of extracting salt from sea water.

Solomon M'Combs, Joseph, Smith, and Benjamin D. Galpin, June 24, improvement in filtering impure water, wine, &c.

William Harwood, July 3, improvement in making pantiles.

Roger Selden, July 7, a perpendicular boring machine.

N. Cutting, July 14, machine for facilitating the spinning of rope yarn, &c.

John Bedford, July 16, improvement in making boots and shoes.

Zachariah Mills, July 17, a swing cradle.

William Wadsworth, July 17, anti-stream boat.

T. Woodsend, Aug. 7, a cover for buildings called artificial slate or tile.

N. Cutting, Aug. 14, apparatus for improving the quality of cables, &c.

Alexis Carrendeffez, Sept. 2, improvement whereby a beautiful yellow paint may be prepared.

J. T. Morgan, Oct. 9, machine for raising vessels out of water to repair them.

George B. Dexter, Oct. 9, apparatus for the sublimation of sulphur.

James Pountrey Wightman, Oct. 21, mixture to render all kinds of woollen cloth water proof.

William Tullock, Oct. 28, improvement in screens for freeing grain from dirt, seeds, &c.

Jonas Dawson, Nov. 6, improvement in suspenders.

James Deneale, Dec. 4, a perpetual oven.

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Louis De Niroth, Feb. 3, composition for covering and flooring houses.

Levi Rogers, Feb. 4, a Traverse sleigh.

David Brown, junior, Feb. 5, machine for winding cotton.

John Matthews, Feb. 6, machine for grinding, sawing, and rasping dye woods.

Parke Shee, Feb. 7, a paper trimmer.

John Beath, Feb. 7, accommodating bolted truss for ruptures.

William Hale, Feb. 7, improvement in the augur.

Jonathan Ellis, Feb. 10, machine for cutting brads.

Samuel Millikin, Feb. 10, mode of making the bottoms of shoes and boots of metallic substances.

Abel W. Hardenbrook, Feb. 10, a water tight swivel screw, adapted to steam engines, stills, &c.

W. Montgomery, Feb. 11, improvement in making boots and shoes.

Abraham Ogier Stansbury, Feb. 11, the Egyptian lock.

Charles Fales, Feb. 11, method of making charcoal from peats.

Richard Button, Feb. 11, a hemp and flax machine.

Ebenezer Lester, Feb. 12, method of making moulds for casting trundle heads, of any kind of metal, &c.

Abraham Hobart, Feb. 17, a tilting waggon.

Abraham Fisher, Feb. 19, a fire place with a flat funnel.

A. Buffum, Feb. 21, machine for carding fur and wool, for hats.

Ezekial Hale, Feb. 22, improvement in the grist mill.

Jesse Reed, Feb. 22, machine for cutting and heading nails at one operation.

Joel Fox, junior, Feb. 25, machine for working a trip hammer with a perpendicular handle.

Gersham and Barnt G. Burtis, improvement in making butter.

Richard R. Elliot, Feb. 28, a washing machine.

Timothy Green, April 1, mode of making salt.

Lewis Dupré, April 1, a pendulum screen.

Charles Colver, April 1, a double forcing pump.

G. Youle, April 1, improvement in the cabouse stove for cooking, &c.

David Peacock, April 1, improvement in ploughs.

Jeremiah M'Ilvain, April 1, machine for dressing shingles and staves.

Elisha Bigelow, April 1, machine for cutting nails.

J. A. Pearce, April 7, machine for propelling boats, &c. by oars.

A. Craig, April 15, machine for raising stumps, &c. from the ground.

Sylvester G. Whipple, April 17, improvement in the application of bark for hats, caps, &c.

Ebenezer Jenks, April 17, improvement in making fire brick.

Jonathan Mix, April 18, improvement in main springs for carriages.

Thomas Pope, April 18, improvement in the construction of bridges.

Barnabas Langdon, April 23, improvement in the steelyard.

Abraham Weaver, April 23, improvement in an apparatus for, and mode of distilling.

Henry Dunlap, April 23, improvement in the splinter bar and swingle trees of carriages, so as to disengage the horses from them suddenly.

A. Pollock, April 23, improvement applicable to fire places and stoves.

Allan Pollock, April 24, improvement in heating rooms, &c.

Simon Willard, junior, April 25, a washing machine.

T. Beatty, April 25, a washing, scouring, and churning machine.

John Sellers and Andrew Bartle, May 5, method of making ropes and lines of any size.

Charles Hammond, May 6, a gunner's quadrant.

Cornelius Tobey, May 7, machine for breaking and grinding bark.

Charles Kinsey, May 8, machine for making paper.

Russel Dorr, May 8, machine for shearing cloth.

Stephen Sayre, May 9, improvement in rigging vessels of every denomination.

Peter Harvey, May 9, improvement in hanging curtains or blinds in coaches, &c.

Thomas Young, May 11, improvement in shingling the roofs of houses, &c.

William Young, May 20, improvement in lasts for boots and shoes.

Jacob Smith, junior, May 20, improvement in the fire engine.

John Green, May 20, mechanical spring buckle.

Christian Hamaker, May 21, improvement in mills.

Josiah Cleaveland, June 6, a washing machine.

Simeon Glover and David Parmelee, June 8, a mortising machine.

W. Phoebus, June 9, improvement in galvanism for salivating, &c.

Stephen Steward, June 20, improvement in stills.

Obadiah Crawford, June 22, improvement in cotton gins.

Enoch Burt, June 23, improvement in machines for shearing cloth.

Jacob Spofford, June 23, improvement in saw mills.

Reuben Buck, June 23, improvement in churns.

Cyrenus Beach, June 26, improvement in the axle and box of carriages.

Michael Freytag, July 1, improvement in the filtering pot.

Ralph Shaw, July 2, improvement in piano fortes, &c.

Jordan Dodge, July 8, method of manufacturing wrought nails and brads.

T. O'Connor, July 9, improvement in condensers in distillation.

Webster Lewis, July 10, machine for making pills.

Jonathan Nichols, July 11, machine for making wrought nails.

Matthew Longwell, July 11, mode of heating water in boilers of steam engines, by the rays of the sun.

John B. Sartori, July 13, improvement in making Italian pastes, maccaroni, vermicelli, &c.

Josiah Cleaveland, July 18, machine for cutting straw.

Benjamin Connor, July 20, machine for cutting straw.

Ebenezer Jones, July 24, a washing machine.

Thomas Bruff, July 24, apparatus for, and mode of cleaning windows.

Joseph Lehman, Aug. 11, in preparing a vermifuge.

Martin Lee and Timothy Barber, Oct. 1, improvement in washing machines.

Buel Cutler, Oct. 3, a churning machine.

Edward Richardson, Oct. 3, improvement in stills.

Thomas M'Ilwham, Oct. 6, moulds for casting copper sheathing nails, &c.

Alexis De Carrendeffez, Oct. 12, improvement in preparing green colouring matter or paint.

Orange Webb, Oct. 14, mode of preparing leather for straps of suspenders, &c.

Joseph Pitkin and Timothy Kimball, Oct. 19, machine for planking hats and making cloth without yarn.

Jesse Arnold, Oct. 26, improvement in the cheese-press.

Richard Wheatly and James Beaumont, Nov. 4, method of manufacturing sheet iron into funnel for stove pipes, &c.

James Butland, Nov. 12, improvement in manufacturing iron.

Seth Vinton, Nov. 18, a plough harrow.

Isaiah Jennings, Nov. 20, method of manufacturing thimbles for the sails of ships, &c.

Anson Blake, Nov. 27, a guage setting machine for saw mills.

Benj. B. Bernard, Nov. 30, improvement in thrashing machines.

Simon Willard, Nov. 30, machine for cutting and heading nails.

S. Willard, jr. Nov. 30, machine for thrashing and cleaning grain.

Simon Willard, junior, Dec. 1, improvement in the water wheel.

William Thornton, Dec. 13, an improved still.

Samuel Rogers, Dec. 15, machine for heading nails.

John Scripture, Dec. 15, a churning machine.

Jerem. H. Pierson, method of manufacturing hoop and sheet iron.

Isaac Pierson, Dec. 24, improvement in rolling and slitting mills.

(To be continued.)